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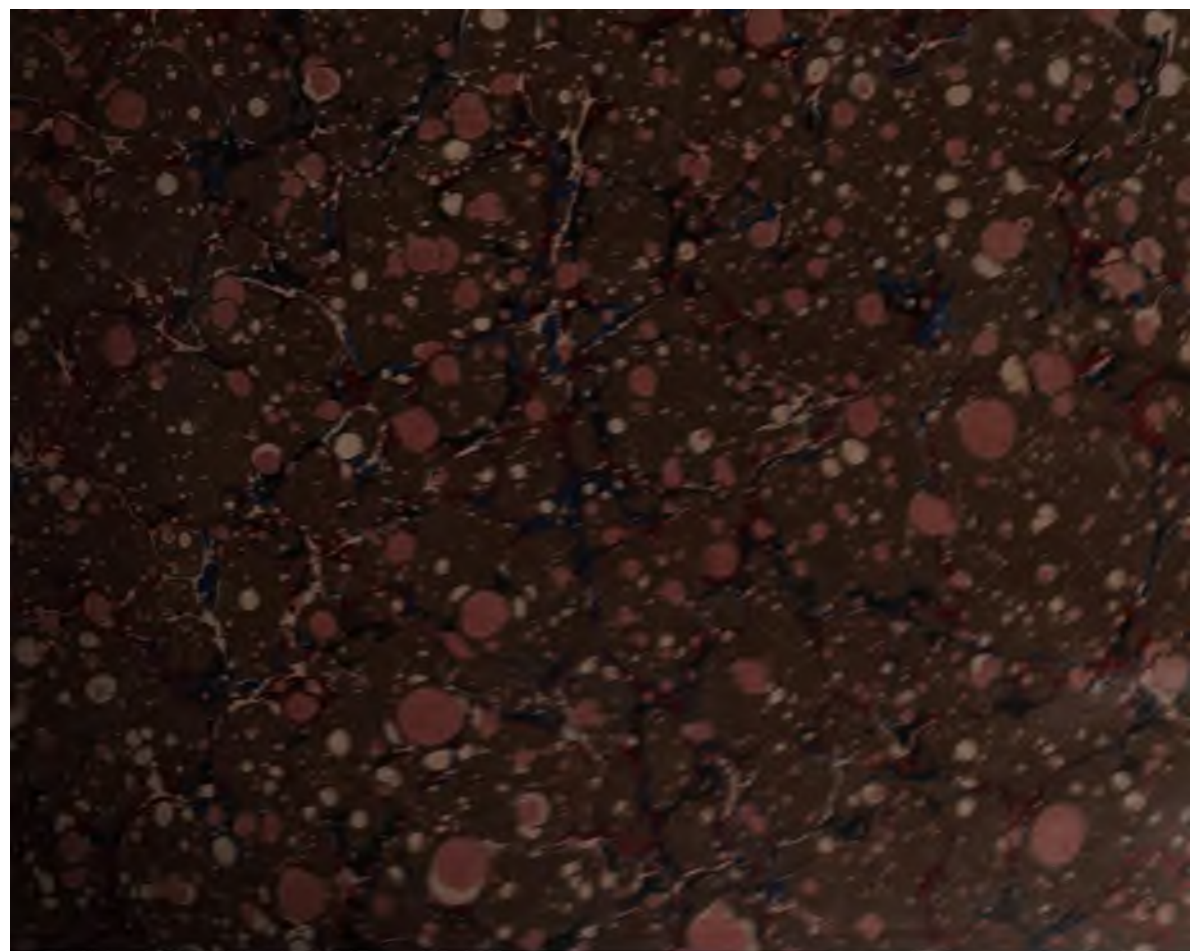
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SAMUEL HENSHAW, Treas.,
Cambridge, Mass.

PSYCHE.

A LIST OF THE ORTHOPTERA OF ILLINOIS.—I.

BY JEROME MCNEILL, FAYETTEVILLE, ARK.

THE following list is an enumeration of all the species of Orthoptera known to me to occur within the State, as well as those species reported by others but not identified by the writer. Names of the last mentioned class are preceded by an asterisk and accompanied by the name of the person upon whose authority they are inserted. If the species is uncommon, one or more localities in which it has been or is reported to have been captured will be given. The earliest date, known to me, of the appearance of each species will be given and unless otherwise stated this date will be understood to be the recorded time of their appearance or capture at Rock Island, Ill.

GRYLLIDAE.

1. *Tridactylus apicalis* Say. Urbana, July 7. Quincy, Sept. 6. Found in abundance on a sand bar in the river at the last mentioned place by Mr. C. A. Hart of Illinois University.

*2. *Tridactylus terminalis* Uhler. Southern Illinois (Thomas, Uhler).

3. *Tridactylus minutus* Scudder. Champaign, Aug. 20.

4. *Gryllotalpa columbia* Scudder.

This "long-winged" mole-cricket I have found in a single locality on Rock Island. This place is between Fort Armstrong and the Powder House on the southern side of the Island. Here the shore is flat and sandy and thickly strewn with fragments of bark and wood brought down by the river from the saw-mills at Moline and left on the low shores by the receding water. My attention was attracted the first time I had the good fortune to walk that way by observing that from many of these pieces of bark which were within a few feet of the water a number of little ridges radiated in crooked lines which, however, never seemed to intersect each other. An exploration of these tunnels revealed at the end of almost every one opened a cricket large or small. August.

5. *Gryllotalpa borealis* Burm. I have found this species as early as June 25 in eastern Indiana. Its first appearance about Moline is early in August. At this season of the year at least it is solitary as all the specimens I have captured have been the sole occupants of burrows. Mr. Scudder has compared its song to that of "the distant sound of frogs." I have been struck with the

resemblance of its note to that of *Oecanthus niveus*. To my ear the only discernable difference is that of pitch. This song is a simple chirp, very low in pitch for an orthopteron, repeated at intervals of about a second. This species can be made to eject from their cerci a grayish viscid substance and this substance can be thrown several inches. Of what use this faculty is to the insect I can only conjecture as I have seen the occurrence but twice. That it is protective in character is very probable as the phenomenon has only occurred in my experience when the insect has been very much maltreated. The ejected mass does not have any noticeably bad odor and if it is used to repel the attacks of enemies it is most probably efficient because it entangles the feet and perhaps covers the eyes of the unfriendly insect.

6. *Gryllus luctuosus* Serv. Very rare. I have captured a single specimen at the electric light and on one occasion I allowed a long winged black specimen which could not be referred to any other species, to escape me in the long grass. I have seen another specimen taken by Mr. C. A. Hart at the electric light in Urbana, June 17. All the specimens I have seen from Illinois are decidedly smaller than specimens from Florida and than those whose dimensions are given by Saussure.

7. *Gryllus pennsylvanicus* Burm. Moline, June 3. This species may be, as Mr. Saussure is inclined to believe, a short-winged form of the preceding species. Except for the shortened or

abortive wings it is scarcely different from *G. luctuosus*, which is abundant southward and very rare in the northern States and Canada. From Maryland to Massachusetts and Northern Illinois *G. pennsylvanicus* is common but it is not reported from Canada and is probably not found as far north as Maine. The species of the genus are so extremely variable and consequently so difficult to separate that the whole subject is in much doubt. This confusion has been so great that I am inclined to think that the habits of entirely different species have been confused so as to lead to serious misunderstanding and worse confusion. I advance my opinion on this point however with the greatest hesitation and I am free to acknowledge that I do not feel entirely sure in my own mind of my conclusions.

In speaking of the habits of these Orthoptera a late writer, Mr. Lawrence Bruner, says: "Usually most of our North American Grylli live singly or in pairs in burrows which they dig for themselves. These are used as retreats during the daytime and serve as shelter from ordinary inclemencies of weather. These burrows are generally forsaken about mid-summer for some sort of above-ground shelter. From this time on, until fall, they appear to be more social and live in colonies under various sorts of rubbish. Grain-shocks are a favorite haunt for them, and since twine has been used for binding, the crickets have been quite troublesome by cutting the bands. During late summer and fall the females commence preparations for

the continuance of their kind, by thrusting their long, slender ovipositors into the loose soil and dropping their eggs. These sometimes hatch the same year, but, as a rule, lie over until the following spring. The young generally live above ground, where they hide among fallen leaves, grasses, and other debris, though sometimes they also creep into chinks and crevices in the earth."

My limited observation leads me to conclude that the description just quoted applies to no single species. The burrow making species is *G. pennsylvanicus* and, probably, *G. luctuosus*. The social crickets are *G. abbreviatus* and *G. neglectus*, which is probably a variety of the first. Briefly recounted, the life history of *G. abbreviatus* is as follows. The eggs hatch in this latitude in July, and the first adults appear as early as the second week in August. During every stage of life they are social, feeding together, seeking shelter in company and when egg laying time comes, in October, the females collect by hundreds in some suitable locality, an abandoned or little used roadway suits them well, and each lays several hundred eggs in an irregular mass. After this duty is performed their business on this planet seems to be finished and they succumb to the cold, none surviving the winter. The eggs do not hatch until the following July or if in rare cases they do they probably perish with cold.

In Florida, *Gryllus luctuosus* attains its growth in December. *G. pennsylvanicus*, which is probably merely the short winged form of the former, is not

found in the southern States and in the middle States it does not have time to complete its metamorphoses in the fall and consequently survives the winter in the larval and pupal stages. In the spring it soon completes its transformations and by the first of June its note is heard. They dig burrows which they occupy probably as long as they live. During the months of June and July the meadows and pastures and especially open woods pastures are filled with the music of their song. Ordinarily in favorite haunts every square rod will contain at least one burrow and these burrows are, of course, sometimes much more abundant. The males never seem to stray away from their houses in the daytime and are frequently found within the entrance, while singing. Where their eggs are laid or when I have never been able to discover, but I have never seen the young before September, so that the eggs are probably laid about the time the young of *G. abbreviatus* are hatching.

G. pennsylvanicus is so far as I have observed never a social species not even I think in the larval and pupal stages. *G. abbreviatus* on the other hand are always social and are never burrow inhabiting, although it is quite probable that on occasion they seek the burrows of their congeners for protection. Mr. Scudder says in his paper on The distribution of insects in New Hampshire, "At Jefferson in 1867 no chirp of a *Gryllus* was heard until August 12, although they often commence their song in Massachusetts in June." If I am right

this absence of the cricket serenade during the months of June and July and early August is accounted for by the fact that this locality is north of the range of *G. pennsylvanicus*. This species has not been, I think, reported from Canada and *G. luctuosus* as rare, so that if I have not erred there should not be heard anything more than an occasional cricket chirp there before the middle of August. The only invariable and easily recognized difference between *G. pennsylvanicus* and *G. abbreviatus* is that in the females of the former the ovipositor is decidedly shorter than the body, in the latter this organ is nearly or quite as long as the body.

8. *Gryllus abbreviatus* Serv. Moline, August 14. Very abundant.

9. *Gryllus domesticus* Linn. Moline and Urbana. Very rare, a single specimen having been taken at each place at the electric light.

10. *Nemobius fasciatus* De Geer. Abundant everywhere, especially in blue grass meadows. It is very common at the electric light about July 27. The wingless form *vittatus* Harr. is at least in the northern part of the State more abundant than *fasciatus*.

11. *Anaxipha pulicaria* Burm. Taken in a single locality on Rock River near Colona, Rock Island Co., about August 20.

12. *Phylloscirtus pulchellus* Uhler. A few specimens have been captured at Pine Hills, September 14, 1883.

13. *Oecanthus niveus* De Geer. Abundant throughout the State from the latter part of July to the late fall.

There are five species of *Oecanthus* in Illinois which are very widely distributed in North America. Two of these, *Oecanthus fasciatus* Fitch and *Oecanthus angustipennis* Fitch, have generally been considered varieties of *Oecanthus niveus* De Geer, but several years observation of this genus has led me to conclude that they are quite distinct in structure, habits, and song and they must therefore rank as species.

The last named species can be distinguished from the two former by its broader wing covers, the width of the dorsal field compared with the length being about one to two in *latipennis* and *niveus*, one to three in *angustipennis* and two to five in *fasciatus*. The average of these dimensions is in the first mentioned species .30 by .62 inches; in the second .26 by .54 inches; in the third .16 by .44 inches; and in the last .18 by .46 inches. *Niveus* can usually be distinguished from all the other species by its color, which is ivory white with almost no perceptible infusion of green in the male but the elytra of the female may be quite decidedly green. In *angustipennis* the male as well as the female, probably, is deeply suffused with green. In *fasciatus* the greenish tint is also predominant in the wings and elytra but the other parts of the body vary in color from deep black to ivory white varied with fuscous. In typically colored specimens however the head and pronotum are whitish with three distinct fuscous or black stripes, extending one over the top of the head and pronotum and the other two on the lateral

lobes of the pronotum and upon the sides of the head. *Latipennis* differs in coloration distinctly from the two last mentioned species but only slightly from *niveus*. Like the latter its general color is ivory white with the elytra perfectly transparent but it is distinct from *niveus* and the other two species in having the head and basal half of the antennae suffused with pink or light brown. It also lacks very generally if not always the small fuscous spots which are to be found always in the other species, except in the case of the black variety of *fasciatus*, on the lower face of the two basal joints of the antennae.

Niveus is also distinguished from all other species by its proportionally longer maxillary palpi. This disproportion is most apparent in the ultimate joint, which is not only relatively but actually longer than the same joint in *latipennis*, a decidedly larger insect. These dimensions are for the two species respectively: fifth joint 1.5 mm and 1.4 mm; fourth joint 1.3 mm and 1.3 mm; third joint 1.6 mm and 1.7 mm. Finally in *niveus* the outer or fourth curved oblique nerve at the base of the elytra is more angular than in any of the other species and consequently the distance between the third and fourth nerves which in the other species is about equal to that between the first and second, and the second and third nerves, is in *niveus* much greater.

In addition to the distinctions already mentioned *fasciatus* has longer antennae than the other species have, since these organs are rather more than two and one half times the total length of the body,

and the larger spines at the tip of the posterior tibiae are unusually strong and acute. The ovipositor of the female is also plainly distinct from the perfectly straight ovipositor of *niveus* in being distinctly turned up at the tip. The maxillary palpi also offer distinct specific characters in the proportionally short fourth joint and in the subclavate fifth joint which in the other species is fusiform. *Angustipennis* differs from the other species in its small head and slender pronotum, which in the female especially is decidedly narrowed anteriorly instead of being of equal width throughout as in the females of *niveus* and *latipennis*. The hind legs are proportionally longer and more slender than they are in the allied species and the post-tibial apical spines are so weak as to be somewhat difficult to count with the unaided eye.

These species differ from one another as markedly in song as in structure. That of *niveus* is the well known *t-r-r-r-e-e: t-r-r-r-e-e*, repeated without pause or variation about seventy times in a minute. In the vicinity of Davenport, Iowa, this song is heard as early as the twenty-third of July and it continues until the persistent little songsters are killed by the heavy frosts of the late fall. This song is heard only at night and occasionally on cloudy days but in the latter case it is only an isolated song and never the full chorus of the night song produced by many wings whose vibrations in exact unison produce that characteristic "rhythmic beat"—as Burroughs has happily phrased it. It

is this effect of many united songs that has led the same author to speak of "purring" crickets. Thoreau calls it the "slumbrous breathing" and the "intenser dream" of crickets, but Hawthorne has given it a more spiritual interpretation than either Burroughs or Thoreau. He describes it as "audible stillness" and declares that "if moonlight could be heard it would sound like that." Prof. C. V. Riley says of the song of *latipennis* that it "is continuous and recalls the trilling of a high pitched dog whistle in the distance." He also says "The commingled shrill of this species recalls also the distant croaking of frogs in the spring." The song of *fasciatus* is also a high trill continuing usually for several minutes with the intervals between the trills of very irregular length. It sings all day as well as all night apparently in the bright sunshine as well as on cloudy days and in the dusk of evening. *Angustipennis* has a song which resembles that of *fasciatus* in some degree, but it is very much fainter and lasts for about five seconds with an equal interval between the trills.

Mr. Scudder says* of the song of *niveus*: "The day song of this insect is exceedingly shrill and may be represented by the following figure [which represents a trill] though the notes vary in rapidity. When slowest they are about sixteen a second. The song is of varied length, sometimes lasting but two or three seconds, sometimes continuing a minute or two uninterruptedly; it is a nearly uniform, equally sustained trill,

but the insect often commences its note at a different pitch from the normal one as if it required a little practice to attain it. When singing the tegmina are raised at fully a right angle to the body. The night song consists of 'thrrr' repeated incessantly, three parts of song and one of rest in every three seconds." The "day song" described by Mr. Scudder seems to be the song of *fasciatus*, while the "night song" certainly resembles that of *angustipennis* more than the song of *niveus*. Walker's *Oecanthus nigricornis* is, I think, nothing but a long-winged *fasciatus*. Specimens of the last-mentioned species with wings extending beyond the elytra as much as .16 of an inch are not uncommon.

Finally, *latipennis*, according to Prof. Riley, generally chooses the tender shoots of the grape in which to lay its eggs, while *niveus* prefers the raspberry and blackberry, but is less particular than the first-mentioned species and lays its eggs in many other shrubs and trees. Both of these species with *angustipennis* prefer cultivated ground, but *fasciatus* is comparatively rare in such localities and is abundant along weedy roadsides and hedges and in weedy meadows. The females are abundant in late summer and early fall on the various species of *Helianthus* and *Solidago*.

14. *Oecanthus angustipennis* Fitch. Much less common in the northern part of the State than either *niveus* or *fasciatus*; it has been taken at Moline Sept. 29.

15. *Oecanthus fasciatus* Fitch. Its

Rep. Geol. N. H., V. I. p. 365-366.

range seems to be coextensive with that of *niveus* and it is even more abundant. The earliest recorded date of its capture at Moline is August 23.

16. *Oecanthus latipennis* Riley. It is doubtful if this species is found as far north as Moline. There is a specimen in the Museum of the University of Illinois labelled Carmi, Ill., Oct. 6, '82. Its song has been described as "a continuous, high-keyed trill continued for fifteen minutes or more." This is exactly the song of *fasciatus*. Since there has been so much confusion in the species of this genus, there is a chance that the song described above is mistakenly referred to *latipennis*.

17. *Oecanthus bipunctatus* De Geer. Apparently an uncommon species in Illinois. I have seen but two specimens captured at Rock Island in August.

18. *Orocharis uhleri*, n. sp. A single specimen in the Museum of the University of Illinois seems so distinct from described species that it deserves a name. It may be described as follows:

Female. Length, .40 in.; post. fem., .36 in.; elytra, .32 in.; ovipositor, .32 in.

Dull brownish yellow with the head, pronotum and posterior femora very obscurely spotted with fuscous. The body and limbs are pubescent with soft hairs, the color of the body. The pronotum is short, with the anterior margin sinuate and the posterior convex. The elytra do not exceed the abdomen. The venation of the dorsal field is not promi-

nent and the reticulation is not lozenge-shaped. The vein which separates the dorsal from the lateral field is unusually prominent, however, and as a consequence the angle formed by the two fields is very distinct. The mediastinal vein, the uppermost vein of the lateral field, is two-branched. Both fields are triangular, so that the elytra are acute at the apex. The wings are scarcely more than half the length of the elytra. The posterior femora are very long, exceeding the ovipositor and almost equalling the body in length. The posterior tibiae are as long as the femora. They are very moderately pilose and are furnished with strong, spreading, acute, brown-tipped spines, seven on the inner and six on the outer margin of the lower face, besides the three at the apex on either side. The lower face of the metatarsus of the posterior legs is armed with similar spines, four on the outer and two on the inner margin. These spines increase regularly in size posteriorly, and the pair at the apex equal fully half the length of this, the metatarsal, joint. The ovipositor is straight with the apex very acute and armed with distinct though minute teeth.

This species can be distinguished at a glance from *O. saltatrix* Uhler by its smaller size, much longer posterior legs, acutely tipped antennae and short wings. In addition to these distinctions, the spines of the posterior legs of *uhleri* are conspicuously large and strong, while those of *saltatrix* are weak and inconspicuous. The posterior tibiae are quite densely pilose in the latter species and only very moderately pilose in the former.

NOTES ON THREE SPECIES OF HYLOTOMA.

BY JOHN GEORGE JACK, JAMAICA PLAIN.

Among the papers of the late Benj. D. Walsh, published in the Transactions of the Saint Louis Academy of Science, (7 May 1873, v. 3, pp. 67-68) is a description of the male and female of *Hylotoma dulciaria* Say. His description of the male appears to differ so much from some specimens which have come under my notice that I venture to give a note of the insect as it appears to me.

After describing the female, Walsh gives the following description of the male:—

"♂ differs from ♀ only as follows:—1. The antennae are $\frac{1}{2}$ as long as the body, the usual hairs on the last joint nearly as long as wide. 2. The tegulae and the entire thorax above and below, except the cenchri which are whitish and the basal plates which are luteo-rufous, are blue black. 3. The abdomen is immaculate. 4. The wings are several shades paler, but there is an obvious darker cloud extending from the base of the stigma to the usual dark dot in the disk of the 2d submarginal, which cloud exists in ♂ [♀] also, but is not noticed from the rest of the wing being equally clouded. Length ♂ .27 inch. Front wing ♂ .27 inch."

Mr. Walsh's description was from a single specimen and it differs so much, by its black thorax and "immaculate" abdomen (the thorax and abdomen of the female being of a shining yellowish-red color), from the specimens taken

by me that it seems hardly possible that it can belong to this species.

H. dulciaria Say, is a synonym of *H. pectoralis* Leach, in Cresson's last revision of the hymenoptera, and upon the male I offer the following note.

Hylotoma pectoralis Leach (= *H. dulciaria* Say). — Male. Head shining black, antennae black and longer than those of female; ciliae beneath appearing either black or rusty colored. Thorax yellowish red above and around the collar; shining blue black beneath and with a yellowish red spot below the fore wings, on the pectus or breast on each side. Legs blue black, the anterior pair having the tarsi, tibiae and the extreme tips of the femora of a light reddish color. Abdomen shining bright blue black. Wings light smoky brown on inner and clear on outer or apical portion. An irregular smoky brown blotch extends from the basal end of the stigma to the third submarginal cell in the centre of which is a minute dot. Expanse of wings 15 mm. Length of body 7 to 8 mm.

Out of four specimens examined, two have four submarginal (or cubital) cells in the anterior wings, corresponding to the characters of the genus. The other two specimens have only three submarginal cells, the second submarginal nervure being absent. Described from four specimens bred with a larger number of females in July, 1889, from larvae found in the previous summer feeding on the foliage of *Betula alba* in the Arnold Arboretum at Jamaica Plain, Mass.

The following observations have been made of the larvae of two species of *Hylotoma*.

Hylotoma scapularis Klug. — The full-grown larvae have a pretty general resemblance to those of *H. pectoralis* Leach (= *H. dulciaria* Say),* and are about 18 mm. long. Head light orange yellow, body somewhat flattish and light yellowish green in color. There are six distinct rows of small closely adjoining black spots on the upper portion of the body extending from the head to the anal segment. On each of the fleshy projections on the sides of the segments, except the last, there is an oblong dark spot; but these spots above the two posterior pair of true legs appear as two large somewhat triangular black blotches. Above the anal segment there is a large oval shaped black spot. The legs are black on the outer side, and the prolegs are marked by a dark brown blotch on the outer side. The black legs and black blotch on the anal segment are the chief marks which distinguish this larva from that of *H. pectoralis* in which the legs and anal segment are yellowish. The cocoons are of a dirty white or light brown color and average about 12 mm. in length. They are composed of two walls, the inner being closely and the outer loosely spun.

The eggs are deposited along the margins of the leaves of the common American elm (*Ulmus Americana*) upon which the larvae feed. Young larvae were found early in Au-

gust and those observed attained full growth about the end of the month. Two males and many females were raised from these about the first of July following.

Hylotoma McLeayi Leach. Full grown larva from 15 to 18 mm. long. Head black. Body flattish; pale yellowish green, with four distinct lines of black spots along the back extending from the head to the anal segment; and with some minute, less regularly arranged spots or dots along the sides above the fleshy projections which characterize larvae of this genus. Each fleshy projection bears a long narrow black spot. The anal segment is surmounted by a large irregular oval black blotch and is brown above the anus. The legs are dark brown or black on the outer base and have a heavy black blotch at the base. The prolegs are marked on their outer side by a somewhat triangular, black or very dark brown spot. The cocoon is double walled, the outer wall being loosely woven and it is dull white or pale brown in color, and is from 12-14 mm. in length.

The larvae were found in considerable numbers in the month of August feeding upon the foliage of common choke-cherry (*Prunus Virginiana*) at Jamaica Plain, Mass. From these larvae a number of female imagoes were bred in the latter part of the month of May following.

A NOVEL DIAGRAMMATIC REPRESENTATION OF THE ORDERS OF INSECTS.†

The difficulty of representing satisfactorily by any linear arrangement the relations of the orders to each other and to Thysanura has compelled us to give diagrams I-III. Diagram II [pl.

1] shows by parallel bars rising above the circular plate, which represents the surface of the earth, the sixteen orders of insects as they exist to-day, and below this plate the different orders are ar-

* See T. W. Fyles in Canadian entomologist, v. 18, p. 38; v. 19, p. 59.

† Reprinted from Guides for Science Teaching. No. VIII. Insecta. By Alpheus Hyatt and J. M. Arms.

ranged in converging bars according to their supposed relations during geologic times. This last is purely theoretical, since the present state of our knowledge of fossil insects is too fragmentary and unsatisfactory to afford sufficient evidences for the demonstration of such a classification.

Diagram II [pl. I] represents the opposite or farther side of Diagram I, the plate having been turned around so that the orders X-XVI can be more clearly seen both above and below the earth's surface. Diagram III is a view from above the circular plate giving in

horizontal section the position of the orders. In Diagrams I, II, *A* represents the wingless, primitive, or Thysanuran stock. The stems *B*, *B'*, *B''**, Diagram I; *B'*, *B'^{IV}*, Diagram II, represent the winged stocks which sprang from *A*. These may have been composed, so far as the facts now known are concerned, of a number of separate or branching lines leading up to the various orders as termini of more or less distinct stocks.†

The line *B'* in Diagram II indicates the winged stock from which the true Neuroptera sprang, and so far as we know, this may have been the same common stock as that from which the Ephemeroptera and Odonata also arose (Diagram I, *B*). In spite of the introduction of the quiescent pupal stage in the Neuroptera, their obvious resemblances to the Odonata, and the fact that they still retain the Thysanuroid form of larva should not be overlooked. Diagram I recognizes these similarities, and presents the least modified and most ancient branches of the genealogical tree of the Insecta as near together as practicable. The placing of Thysanura near the centre, by means of a short

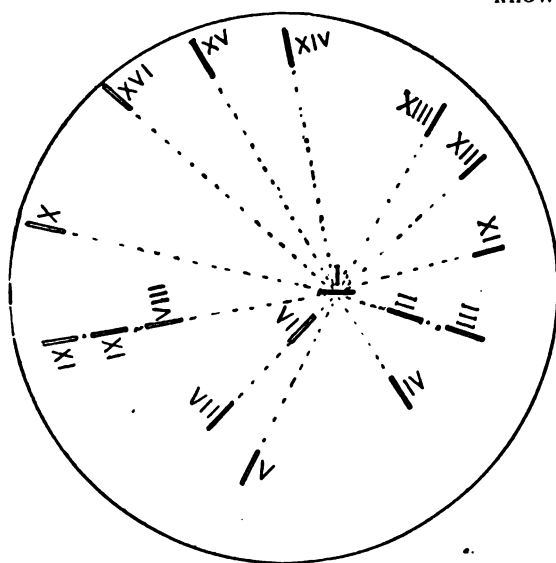
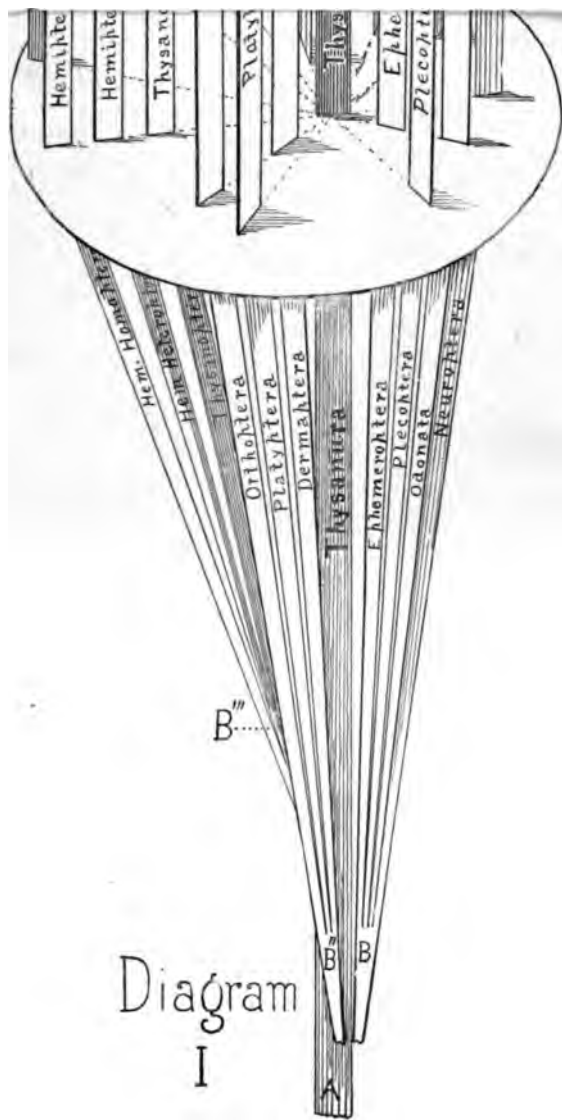


Diagram III.

* *B'''* extends in the diagram to the orders Hemiptera and Thysanoptera instead of to the stem from which these orders sprang. It is placed here because the stem proper is out of sight, being farther down and behind *B* and *B'*.

† For example, as suggested by Packard in Third Rep. U. S. Ent. Com., p. 289, the Dermaptera may have been derived from a form similar to *Japyx*, a curious Thysanuran genus, and since it has characters allying it both to Orthoptera and Coleoptera, it may be the existing descendant of some common forms from which both of these orders originated. The Thysanura stand, according to Comstock, in a similar position with relation to the Hemiptera.



vertical line,* indicates the essentially generalized and larval character of the order, and does not necessarily imply any nearer relationship to Neuroptera, which stands on the right; than to Coleoptera on the extreme left. The height to which the vertical bars have been carried above the plate is a rough approximation to the specialization attained by the adults, and also to the removal of the mode of development from the primitive Thysanuroid mode.

The orders existing to-day are regarded as parallel series differing from each other in structure, and not as yet connected by well-known intermediate forms. Where the probability exists that certain orders have had a common origin, they are placed on the same radiating lines, as seen in Diagram III, orders II-III; also VI-VII, and VIII-IX; and this rule has been departed from only where the data seemed to justify a more natural interpretation, as

in the case of the orders from XII to XVI, inclusive.

All of these graphic presentations are necessarily extremely rough approximations to the actual facts, and present even the authors' views in a very imperfect manner. Nevertheless, if conscientiously studied, they will, it is hoped, help to give teachers some ideas of the principles upon which a classification is based, and prevent them from falling into the absurd but natural mistakes often occasioned by the linear treatment of types in the text.

LIST OF ORDERS.

I. Thysanura.	IX. Hemiptera.
II. Ephemeroptera.	X. Coleoptera.
III. Odonata.	XI. Neuroptera.
IV. Plecoptera.	XII. Mecoptera.
V. Platyptera.	XIII. Trichoptera.
VI. Dermaptera.	XIV. Lepidoptera.
VII. Orthoptera.	XV. Hymenoptera.
VIII. Thysanoptera.	XVI. Diptera.

DESCRIPTIONS OF THE LARVA AND PUPA OF SCOTOBATES CALCARATUS FABR.

BY WM. BEUTENMULLER, NEW YORK.

LARVA:—Head subquadrate, anterior angles obtusely rounded, sides moderately rounded, shining. Clypeus transverse, about three times as broad as long, oblique. Labrum smaller than the clypeus, anterior margin rounded and beset with a few bristle-like hairs. Antennae three jointed, first joint cylindrical, about twice as long as broad;

second joint considerably longer, clavate; third joint minute, cylindrical, with a few hairs at the apex. Mandibles short, stout, arcuate externally, excavate internally, apex tridentate, base with a prominent elevation with two small teeth. Maxillae subcylindrical, stout, elongate, lobe somewhat truncate at the apex with a number of bristle-like hairs. Maxillary palpi three jointed, first joint stout, cylindrical, broader than long;

* See also the diagram given by Packard in Third Rep. U. S. Ent. Com., 1883, p. 295.

second joint more slender and longer; third joint subcylindrical, thicker at the base than the apex, which is beset with minute points. Labium subquadrate, broader at the apex than the base. Labial palpi two-jointed; first joint thick, cylindrical; second joint slender, rounded at apex. Body corneous, highly polished, minutely punctured, last segment terminating in two short protuberances curved upward. Over the body are scattered a few light brown hairs. Color: head and body testaceous. Body beneath somewhat paler. Length about 25 mm. Width about 3.50 mm.

PUPA sordid white, elongated, with each of the abdominal segments at the sides provided with a flat, quadrate process. Anal segment with two rather long processes at the extremity. Thorax subquadrate, sides rounded. Head bent downward; wings folded around the sides of the body. Length 9 mm. Width 5 mm.

Lives on wood of oak, chestnut, and hickory. Collected early in April. Pupated May 18th. Imago emerged June 9th.

A NEW INTRODUCTION TO ENTOMOLOGY.*

—We have here a novel and suggestive book, in which the interrelationships of insects are worked out on independent lines. Neither Professor Hyatt, a zoologist and paleontologist of the very highest repute, nor his associate Miss Arms, has ever before claimed a hearing in the entomological world, and they have approached the subject quite untrammelled by tradition or authority, but with experience as successful teachers and thoroughly imbued with the principles which guide modern science. It is not a text book for scholars, but precisely what its title indicates, a guide for teachers. It abounds with novel suggestions, and is interspersed with cautions of the utmost importance to teach-

ers. We have room here for only one passage, in which the limitations of the Darwinian theory are enforced:

"It is very important that teachers should be cautious in allowing themselves the free use of explanations which the doctrine of Natural Selection seems to furnish. The danger lies in the fascination of the logical form presented by this doctrine, the ease with which it seems to explain even the most complicated relations of organic beings, and the general although unfounded belief that it is universally accepted and believed in by naturalists. They will find . . . that this doctrine is not used by any investigators in accounting for the origin of structures and their modifications, and only to a limited extent by those quoted above and others of the same school [the so-called Neo-Lamarckians], in explaining the preservation of structures and modifications after they have been originated by the action of physical and other causes."

A diagrammatic scheme for illustrating the authors' views of the phylogeny of insects is given on a preceding page of this number, and we hope to print at an early date their concluding general remarks, after a survey of the whole field.

RECENT ENGLISH PUBLICATIONS.—The fourth part of Buckton's *Monograph of the British Cicadæ or Tettigidae*, just issued, completes the first of the two volumes of which the work will be composed. The first volume contains 41 plates and 211 pages of text, 78 of the latter given up to the Introduction. The remaining volume will treat of the Jassides, Deltocephalides and Typhlocybides of the classification adopted by him.

The fourth part of Moore's *Lepidoptera Indica* is of less interest than the preceding. The plates are still concerned with the Euploeinae but only with species of very similar appearance having a dull brown ground color, and of which the early stages are not known. The modification of the hind mar-

**Insecta* (Guides for science-teaching, viii). By Alpheus Hyatt and J. M. Arms. 16mo, Boston, 1890. Published for the Boston Society of Natural History by D. C. Heath & Co. pp. 23, 300, figs. 223.

gin of the fore wings in the males of all these species to accommodate the sexual scale-pocket in the medio-submedian interspace is a striking feature. The text, which keeps excellent pace with the plates, has many points of interest and calls attention to some interesting cases of mimicry.

Mr. W. F. Kirby has just published with Van Voorst's successors a synonymic catalogue of dragon-flies living and fossil. It extends to 202 pp. 8vo. They are arranged systematically under families, subfamilies and divisions, the further subdivisions by Selys and others, legions and groups, being ignored. So too all subgenera are regarded as genera. This has at least simplified the author's work, but can hardly be regarded as satisfactory. A number of new generic terms are employed for preoccupied names and in a few cases radical changes occur, as when *Agrion* is made to replace *Calopteryx* (because Latreille had fixed the type as the *Libellula virgo* of Linné) and a new term *Coenagrion* employed for *Agrion*, carrying with it the subfamily name *Coenagrioninae*. Selys strenuously objects to this in the *comptes-rendus* of the Belgian entomological society. About 1800 nominal species are entered in 267 genera, besides a few in the appendix. 102 fossil species are catalogued separately. The work appears to be conscientiously done and will certainly be of as great an assistance to the students of Odonata as that of Lepidoptera, prepared by the same author, is to its votaries.

THE MARCH OF HYPERCHIRIA 10.—I have carefully watched a brood of 10 larvae in their marching, and have found the secret of their regularity. The leader spins a fine thread as he moves, and the larva next in order follows the thread, and spins one himself. If he follows the thread by feeling it at one side, instead of following *on* it, the thread which is spun by No. 2 lies parallel with that spun by No. 1, and usually each thread will be followed by a larva, when the wedge-shaped "order of march" will result—

No. 1 ahead, No. 2 following just a trifle at one side, No. 3 and No. 4 side by side, No. 3 following the thread of No. 1, and No. 4 that of No. 2; No. 5 will follow No. 3; No. 6 will often feel the two threads and march between them, when No. 7 will follow No. 4, and so the ranks will widen. The thread can be seen plainly with a lens, and the process watched. If a larva loses his way he feels for the thread, and seems able to tell, by its surface, in which direction the procession has gone, always following the right direction after a moment's careful feeling of the thread. *Caroline G. Soule.*

MORE DAMAGE BY WHITE ANTS IN NEW ENGLAND. — At a recent meeting of the Cambridge Entomological Club Mr. S. H. Scudder showed the work of white ants, *Termes flavipes*, on the wooden tubs containing plants at the Botanic Garden. This and some of the culprits were brought to him by Frederick A. Quinn, one of the employes of the Garden, who stated that they had destroyed some of the tree-ferns growing in such tubs. This shows that the white ants are there increasing in numbers and have become a real element of danger, for in 1885 Dr. Hagen reported in the Canadian entomologist (v. 17, 134-135) that "the earth in the hot-houses here in Cambridge is largely infested by white ants, but as far as I know no destruction of plants has been observed." Two years later the speaker pointed out (*ibid.*, v. 19, 218) that geranium cuttings were attacked by white ants in the forcing houses attached to the Mt. Auburn cemetery; but here we find a more serious damage. On visiting the Garden Mr. Scudder was shown by the head gardener, Mr. Cameron, a plant almost completely destroyed in which the traces of their work were very apparent. The plant was *Cyathea insignis*, four or five feet high. One of the same kind had been destroyed before and thrown away. According to Mr. Cameron, the ants seemed to show a preference for the

long juicy stems of the fronds, to which they made their way through the trunk, while the latter was full of their droppings. The first outward sign of their attacks was seen in the drooping of the fronds. The inner sides of the wooden staves of the tubs were full of the irregular burrows of the white ants. Mr. Cameron also stated that a lot of cabbages in the vegetable garden attached to his house on the grounds were completely ruined by the attacks of these same white ants, as he found by inspection. Mr. Scudder recommended replacing all woodwork in contact with earth or stone by iron, and particularly the discarding of all wooden tubs; it would seem to be perfectly practicable to construct even the largest tubs of staves made of galvanized iron or some such metal.

AMPELOPSIS VEITCHII has been good hunting ground this year. I have found on one vine specimens of *Deidamia inscripta*, one; *Thyreus Abbotii*, several; *Everyx myron*, several; *Alypia octomaculata*, *Pyrophila pyramidoides*, both very abundant; *Spilosoma virginica*, few; *Hyphantria textor*, few; *Lophocampa caryae*, many; *L. tessellaris*, several; and *Cimbex ulmi*, many.

Caroline G. Soule.

A NEW SERIAL iconography is announced under the auspices of Mr. Paul Mabille and Vuillot of Paris, to be called *Novitates Lepidopterologicae*. These authors contemplate the issue of at least one hundred monthly parts of lexicon octavo size, each with eight pages of text and one colored plate, illustrating new and little known Lepidoptera. Only 150 copies are to be issued — a wrong to science — at the price of about three francs a part.

A SPECIMEN of *Vanessa milberti*, said to have been taken at Polegate, Sussex, England, was exhibited at the South London entomological and natural history society on October 9th.

DR. CARLOS BERG, formerly attached to

the Museo publico of Buenos Aires under Burmeister, and well known for his notable contributions to the entomology of South America, has been appointed director of the Museo de Historia Natural of Montevideo, Uruguay, and is now removed to that city.

PROCEEDINGS OF SOCIETIES.

CAMBRIDGE ENTOMOLOGICAL CLUB.

13 January, 1888.—The 134th meeting was held at 61 Sacramento St. Mr. S. H. Scudder was chosen chairman.

The annual report of Mr. R. Hayward, the retiring secretary, was read and accepted. The report of Mr. B. Pickman Mann, the retiring treasurer, was also read and referred to the auditors. The retiring librarian, Dr. Geo. Dimmock, presented his report which was accepted.

A vote of thanks was passed to Mr. B. P. Mann for the use of his office on Follen St. as a storage place for the library of the Club since its organization.

A ballot for officers for 1888 then followed, which resulted in the election of the following gentlemen: President: William Trelease. Secretary: Roland Hayward. Treasurer: Samuel Henshaw. Librarian: George Dimmock. Members at large of Executive Committee: George Dimmock and Samuel H. Scudder.

On motion the thanks of the Club were voted to Mr. B. P. Mann for his long and faithful services as treasurer of the Club.

Mr. Scudder being obliged to leave, Mr. S. Henshaw was then chosen chairman.

On account of the absence of the president, Mr. J. H. Emerton, the reading of the annual address was postponed till another meeting.

Mr. C. W. Woodworth showed a new method for mounting small insects, which gave rise to some discussion; and Dr. G. Dimmock showed an apparatus for maintaining a constant temperature in raising insects.

PSYCHE,

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PSYCHE.

ON THE RELATION BETWEEN SCIENTIFIC AND ECONOMIC ENTOMOLOGY.

BY CHARLES W. WOODWORTH, FAYETTEVILLE, ARK.

[Annual address of the retiring president of the Cambridge Entomological Club, 9 January, 1891.]

The subject of this address is not of the kind usually chosen for similar occasions but is of none the less interest and importance. It is one also that is in full harmony with the genius of this society which is the recognition of the preeminence of what is called the philosophy of science. Another reason makes it of especial immediate importance to us. Economic entomology is upon the verge of an era of great advancement. The establishment of the agricultural experiment stations have added to its ranks more young men of scientific training and ability perhaps than have ever engaged in this line of investigation. If economic entomology is but a phase of scientific entomology then we want to put forth especial efforts to assimilate this young blood in our ranks; if on the other hand they are different and distinct, the difference will become more and more apparent as economic entomology develops and we should define our position as on the side of pure science.

I believe that the pure sciences are distinct from the economic sciences; that this is the primary division of science. We seem to be prone in this utilitarian

age to try to find excuse for the pursuit of pure science by holding up the possibility of applying our discoveries for economic ends. Let us recognize and not act as though we were ashamed of the fact that the sole aim of the student of pure science is the discovery of truth, catering to human wants being entirely out of his province.

It may be said that laying aside this matter of sentiment, the human wants are supplied through the discoveries of science and that this is simply the application of science for economic purposes, or, to put it a little stronger, that economics are but applied sciences. Such a statement comes from the conception that facts are or in some way become the peculiar property of a science. This is not the case however. Perhaps if we could see all the intimate relations sciences have to each other we should say that every fact belongs to every science; at any rate we could scarcely name a fact which when closely viewed has not more than one bearing. An example of the far reaching character of a fact is that of the origin of species through evolution. When Darwin es-

tablished the truth of this fact it soon came to be recognized that this basal fact of evolution was a fundamental principal of almost every other science which had occupied the attention of man. For economic purposes it is the facts which are appropriated, and in the same way that the biologist appropriates the facts discovered by the chemist. Economic sciences no more become departments or applications of other sciences by using some of the same facts than biology becomes a department or application of chemistry.

It may be further contended that in the cases cited above we have to do with real sciences but that the so called economic sciences have no right to the title of science, that they are essentially different. This will lead us to a consideration of what a science is. We have just seen that it does not consist of a body of facts peculiar to itself, but on the other hand it is evident that facts are closely connected with it, that it depends indeed on a set of facts, and further that these facts have some definite relation to each other and are susceptible of a rational classification. This classification is not the science as it cannot express nearly all the relationships, but these relationships do constitute the science. Any one science does not comprehend all the bearings of any fact but only such as have a relation to that one subject. The science of entomology, for example, consists the of relationship of the facts to insects. The relation of the same facts to the subject of plant diseases belongs to another science. When

the subject is economic, the production of honey, the feeding of stock, or the like, are there any grounds upon which we can refuse it the title of science?

The economic sciences are all infantile, many perhaps not yet even conceived of by man. They are the only true foundation to the useful arts. Agriculture is a science though hidden by a mass of misconception and empiricism. It must make its advances by the same methods that have made the pure sciences what they are. A clear conception of the object and structure of the science and experimentation with all the conditions under control are essential. Economic entomology as generally understood is chiefly a department of agriculture but includes much heterogeneous material. To be a scientifically rational term, it must, like some of the genera of the older naturalists, be restricted. I can in no better way show the difference between it and scientific entomology than to indicate the parts of economic entomology and show where they belong among the economic sciences.

Insects of economic importance may be grouped into six categories. First, those directly injurious to man, which properly forms a department of medicine. Second, those attacking the domestic animals, a part of veterinary medicine. Third, those injuring cultivated plants, which includes by far the major part of the injurious insects and to which the term economic entomology should be restricted; it is only a part and perhaps not a natural part of the

science which deals with the diseases of cultivated plants. Fourth, those which destroy other property; in this category are the insects attacking furs, woollen goods, etc., and the food stuffs, which belong to domestic economy and at the same time to commerce; library insects belong to library economy and so on. Fifth, those directly beneficial to man, which includes the bee, the silk worm, etc., industries which form one of the primary divisions of agriculture. Sixth, those indirectly beneficial to man by destroying the injurious insects; these in-

sects of course belong to the sciences that consider the insects which are their victims.

Finally, to recapitulate, scientific entomology is a department of biology, economic entomology of agriculture. They have all the difference between them that there is between a pure science and an economic science. Can we as a society include them both? I think we should not. On the other hand the economic entomologists are nearly all at the same time scientific entomologists. These we can and do welcome.

A LIST OF THE ORTHOPTERA OF ILLINOIS.—II.

BY JEROME MCNEILL, FAYETTEVILLE, ARK.

LOCUSTIDAE.

19. *Scudderia curvicauda* De Geer. This is an abundant species in Illinois in suitable localities. Its favorite haunt is the wild meadows and prairies covered with coarse grasses and weeds. It is the only one of the katydids that flies freely in the daytime. It is in fact crepuscular rather than nocturnal. It may be seen flying at any hour of the day, but its note is not generally heard until the middle of the afternoon. The note cannot be supposed to represent more than the first two syllables of the "Ka-ty-did" or "Ka-ty-did-n't" of its congeners. It is made but once and the rasping jerky sound has been very well represented by Mr. Scudder as

bzrwī. It has been found at Moline as early as the 21st of July.

20. *Scudderia fuscata* Brunner. This species is more abundant than the last but it too must be looked for in the right place. It is even less domestic in its habits than *curvicauda*. The latter is sometimes found about houses and gardens in town but the former is almost never seen in town. It may be looked for in the shrubs and undershrubs of open woods and clearings and in weedy fields and meadows. Its note is indistinguishable from that of *curvicauda* but it is much less frequently heard. The earliest recorded date of its capture at Moline is August 4th.

21. *Amblycorypha oblongifolia* De

Geer. This species like the last is partial to shrubs but it is much more common in the vicinity of houses in towns. Its note is a quick shuffling sound which resembles "Katy" or "Katy-did" very slightly. It sometimes flies in the evening but much more rarely than *S. curvicauda*. It makes its appearance in the neighborhood of Moline about the first of August.

22. *A. rotundifolia* Scudder. This species resembles the preceding in song and habits. In northern Illinois it makes its appearance about the tenth of August.

23. *Microcentrum laurifolium* Linn. I have never captured this species at Moline nor have I heard its note there, which may be represented by the syllable "tic" repeated from eight to twenty times at the rate of about four to the second. It is a tree-loving species, very common in Missouri, according to Riley, and therefore presumably common in southern Illinois.

24. *Cyrtophyllus concavus* Harr. This is the true "Katydid," common wherever there are trees. Its song is better known and the insect itself less known, because of its arboreal habits, than either of the other katydids. This species moves about so little that it is not unlikely that in many cases an individual spends its whole life upon a single tree. I have listened to the song of one katydid on a certain tree every evening for more than two months. I have noticed repeatedly that on any evening when they are singing there are the same number of individuals, as indicated

by the number of songs. Of all the specimens I have collected on the ground or had presented to me, probably a dozen, only a single one was a male. I have collected in sweepings hundreds of specimens of the young of *Scudderia* and *Amblycorypha* but not one of *Microcentrum* or *Cyrtophyllus*; but if *Microcentrum* does not leave the trees when in the larval and pupal stages it certainly does when it reaches maturity. It is then a great wanderer, coming frequently to the electric light. I have never known *Cyrtophyllus* to come to a light. So far as I know this is the only species of Orthoptera in which the male is not smaller and more active than the female. It is the only green, winged Locustid with which I am acquainted that does not have the wings longer than the elytra. These facts are not improbably mutually related. It may be surmised that, in the evolution of species, the katydid that developed in the greatest degree its musical apparatus had the least need of hunting up his partner when the mating season came round, and as it was so well protected by its form and color and arboreal habits as to have little need of wings, these organs have gradually degenerated into a musical and protective apparatus. As the male was released from the necessity of hunting up the female, he would naturally lose after a time his sligher but more active body: it is easy to see how arboreal habits once acquired may react upon the entire organization. If at first glance it seems strange that two species so much alike as *Oecanthus niveus* and *Oecanthus*

fasciatus should differ so much in singing habits, the latter singing as constantly in daytime as at night, while the former is strictly nocturnal in its song, we have only to consider, in order to remove the difficulty, that *fasciatus*, being terrestrial, is not easily exposed by his song to the attack of birds, while *niveus* would inevitably be discovered should he venture to sing when his bird enemies were most active. This consideration will explain equally well, of course, why the arboreal katydids, *Microcentrum*, *Amblycorypha* and *Cyrtophyllus*, are silent in the day time and why the only one of the group that sings in the day time is terrestrial rather than arboreal. The case of *Conocephalus robustus* offers a still better illustration of the truth of this theory. This species lives both upon trees and in the grass; but while its song may be heard in the grass while the sun is high, I have never heard it from trees until after dark.

25. *Conocephalus ensiger* Harr. This species is common in Northern Illinois from the first of August until frost. It occurs as frequently along the weedy roadsides and in the gardens of suburbs as in the country. Its song is a loud rasping *zip-zip-zip* repeated indefinitely. It does not begin to sing until dark.

26. *Conocephalus nebrascensis* Bruner. Is a less common species than the preceding; not reported farther east than Illinois, but occurring as far west as Nebraska. It is more shy in its habits than *ensiger*, never being found, so

far as I am aware, about the streets of a town. Like both of the other species occurring here it seems to have a great liking for Johnston grass, a species of *Andropogon*; but it is by no means particular in its habitat, as it may be found in little colonies in weedy or grassy places throughout the locality it inhabits.

If *ensiger* may be said to sing the first part of the song of *Orchelimum vulgare*, the well-known *zip-zip-zip-ze-e-e-e*, *nebrascensis* may be said with equal truth to sing the last part of the song, that represented by the *ze-e-e-e*; but the sound is much more resonant, being really in quality much more like the song of a Cicada, but not so loud and without a swell. It begins to sing earlier in the evening than *ensiger*.

27. *Conocephalus robustus* Scudd. My cabinet contains a single specimen of this species captured on the sand-hill referred to below. Its song is indistinguishable from that of *dissimilis*. The specimen mentioned above was captured the 28th of August.

All the species of *Conocephalus* seem to possess more intelligence than is usual in Orthoptera and they are about the most difficult of the order to approach. In escaping they usually slip or fall into the grass instead of jumping or flying; but they seem to fully understand that they are very well protected by their color and form. If approached very cautiously they often remain quite still upon the stem of grass upon which you have surprised them with the usually well-founded expectation that you will not be able to distinguish them from

the green herbage around. If they think it worth while to make some active movement to escape, they will frequently slip round on the other side of the stem and walk down to the ground or off upon another plant. Unlike most Orthoptera they do not use their front legs in holding to the mouth the thing upon which they feed. Instead of biting they seem to wrench or tear away pieces from the stems or leaves.

28. *Thyreanotus pachymerus* Burm. This is the first Orthopteron hatched in the spring in northern states. It may be easily recognized by the gray top and shining black sides of its pronotum and by its very long and slender antennae. Very little seems to be known of its habits, but in captivity it shows a decided taste for animal food, and it may be not unreasonable to suppose that it is at least partly carnivorous in the wild state. It is found usually in shaded ravines, upon the bare ground or the trunks of trees or under rotten logs. First appearance, Aug. 9.

29. *Xiphidium fasciatum* De Geer. Abundant everywhere, in blue-grass meadows especially. Its song is a faint echo of that of *Orchelimum vulgare* with the "zip-zip" omitted. It is, I believe, the first of the green grasshoppers to reach maturity and its faint little quaver is the first note of the great chorus that sounds in all the meadows from the first of August until the first of October or until cold weather. I have captured this species as early as the first of July.

30. *Xiphidium brevipenne* Scudd. This is a much less common species

than the preceding but it is not rare in damp meadows. It first appears here about the middle of August.

31. *Xiphidium ensiferum* Scudd. I have obtained numerous specimens about Moline which I refer to this species with certainty, but in many cases I have the greatest difficulty in deciding whether others should be referred to this or the preceding or still other species. Both species apparently may have the under side of the posterior femora armed with spines and both seem to have forms in which there is a peculiar modification of the grasping organs of the male. Further study may enable me to tell certainly whether they are two or more or only one species. I have two forms which I place here that have wings and elytra extending much beyond the knees.

32. *Xiphidium* sp.? A single specimen which is apparently deformed has the ovipositor growing out of the upper side of the apex of the abdomen with the convex side up. In shape and size it resembles the preceding species but the ovipositor is curved instead of straight and two and one half times as long as the body.

33. *Xiphidium strictum* Scudd. Not rare in places similar to those frequented by *brevipenne* and *ensiferum*. It is found from the first of August to the middle of October or later. My cabinet contains a single specimen of this species with elytra extending to the knees and with the wings .25 of an inch longer.

34. *Xiphidium nemorale* Scudd.

This is a wood species. It is found most commonly on sparsely wooded and rather barren hillsides. It is almost equal in size to *strictum*. The elytra of the males are unusually ample although not longer than the abdomen and the veins of the stridulating apparatus are conspicuously large. The song is louder than that of *fasciatum*; it consists of two parts, the first a short abrupt note which is very well represented by the syllable *zip*, the second is the familiar *ze-e-e* which lasts about half a second and is made from one to five times; the *zip* is not repeated. I have not found it at Moline earlier than August 20th.

35. *Orchelimum vulgare* Harr. Abundant throughout the State. I have heard its note as early as the 21st of July. Its song is the familiar *zip-zip-zip-zip, ze e-e-e-e*. The staccato first part is repeated about four times, usually about twice a second; the *ze-e-e-e* continues from two or three to twenty or more seconds.

36. *Orchelimum glaberrimum* Burm. This species is very like the last and is very probably nothing more than a variety of *vulgare*. While it seems to be constantly larger and more robust it has the same form of pronotum. The wings are of the same length relative to the elytra, the posterior femora are similar in form, relatively of the same size, and destitute of spines on the under side. The two stripes on the disk of the pronotum are not uncommon in *vulgare*. I have a single specimen from Ettingham county, which is south of the center of the State.

37. *Orchelimum longipenne* Scudd. This species, if I have correctly determined it, is very like *vulgare* with long wings. It has, however, proportionally shorter legs, longer wings, with the elytra considerably shorter than the wings instead of equalling them as in *vulgare*. It is much less common than the last mentioned species but it is not rare and is found in similar situations at the same time.

38. *Orchelimum concinnum* Scudd. I have a number of specimens which I refer to this species though the females with one or two exceptions differ in coloration in a marked manner from typical specimens. The specimens referred to are almost completely infuscated with the elytra lighter or even green apically and the tarsi distinctly green. But one specimen, a male, has the brown stripe extending down over the face. I have captured them as early as the second week in August. They are partial to low, damp or swampy meadows.

39. *Orchelimum nigripes* Scudd. This handsome species is about as common at Moline as *vulgare*. It is not at all shy but is likely to be found in the grass or shrubbery about the house. It even shows a preference, I have thought, for human society. During the past summer an instance came under my observation of one keeping a place over the wooden finish of a doorway for more than a week. If he ate during that time he must have been obliged to leave his post to satisfy his hunger, and he probably returned many times to the place. The song is difficult to distin-

guish with certainty from that of *vulgare* but usually the *zip-zip* is repeated only once or twice very rapidly and the *ze-e-e-e* does not continue so long. The earliest recorded date for it here is the 1st of August.

40. *Orchelimum silvaticum* n. sp. A species occurs here not very rarely that I have thought until recently to be *O. agile* De Geer, but a careful comparison with typical specimens of that species shows so many points of difference that I think they should be considered specifically distinct.

Length of body ♂ .70 ♀ .70; length of elytra ♂ .60 to .70 ♀ .56 to .70; length of posterior femora ♂ .59 ♀ .59; length of antennae ♂ ♀ 22; length of ovipositor ♀ .32. Very similar to *agile* but different in the following particulars: The elytra and wings are shorter and in the male, at least, the latter do not exceed the former. The posterior femora are relatively shorter and less attenuated apically though similarly armed with about three small spines on the under side of the apical half. The pronotum is conspicuously larger and the lateral lobes are decidedly wider at the humeral sinus. The brownish stripes on the disk of the pronotum are more remote from each other. In the proportions of the body, pronotum, hind femora, wings and elytra this species approaches *vulgare* much more closely than *agile* but it can be separated at once from the former by the presence of the spines on the under side of the hind femora.

I found this *Orchelimum* first on corn afterw rds more commonly in open places in woods. Its stridulation is quite distinct from that of *vulgare*. It consists of the same two elements but the *zip* is repeated many times very rapidly

so as to make almost a continuous sound and the *ze-e-e-e* is comparatively short and very constant lasting about eight seconds. The first part of the song lasts from three to five seconds. I have not taken this species before the 7th of September.

41. *Orchelimum volantum* n. sp. A second species occurs here which I think has not been described unless I am mistaken in my identification of *longipennis*. In this case the supposed new species might be the latter. The specimens which I refer to *longipennis* agree in every particular with the description of that species and the new species does not agree in the characters given and it has so many characters strikingly different from any *Orchelimum* that I know that I think there can be little risk in making a synonym if I describe it.

Length of body, ♂ .72 ♀ 1.04; length of elytra ♂ 1 ♀ 1.40; length of wings ♂ 1.12 ♀ 1.50; length of posterior femora ♂ .66 ♀ .88; length of antennae ♂ 2.25 ♀ 2.50; length of ovipositor .44. The general color is green with the usual brown band on the head and pronotum very incomplete. On the disk of the pronotum it divides into two stripes which form almost a complete ellipse enclosing a short stripe on the front part of the disk while on the posterior part these stripes diverge but do not extend beyond the principal sulcus. The pronotum is of medium size, with the lateral lobes well rounded on their lower border and the humeral sinus deep. The vertex is decidedly turned up at the tip and the occiput is flat so that the top of the head is strongly concave. The elytra and wings are very long and narrower in proportion than in any

other *Orchelimum*. The elytra are so strongly reticulate that they look rough. In the female they are peculiar in having the anal field form a distinct angle (as in *Scuderia*) with the rest of the elytra. In the male they are peculiar in that the posterior vein of the stridulating apparatus is transverse instead of oblique as in the other species and only half the length of the adjacent vein on the right instead of twice as long as it is usually. The posterior femora are slender and armed below on the posterior half with several small spines. The ovipositor of the female is long, slightly curved on its upper side and slenderly acute.

This very marked and handsome species I found on the banks of Rock River near Cleveland in Henry County. The specimens upon which this description is based were found in a clump of rank growing *Sagittaria variabilis* which grew in the angle of an old wall that had once formed a part of the foundation of a mill. A peculiarity in the stridulation attracted my attention and led to the discovery of this as well as the preceding species. I was passing this forementioned clump of weeds in a canoe when the peculiar stridulation fell upon my ear and I at once proceeded to investigate the cause. These specimens, unlike any *Orchelimum* with which I

am acquainted, flew about from one broad leaf to another. The song has a new note in it. It may be represented as follows: *zip-zip kr-ze-e-e kr-ze-e-e*, the last part of the song not lasting more than a half to three quarters of a second and is always preceded by the sound which I represent imperfectly by *kr*. I have found this species in no other place and it must be very rare as its unusual note would have betrayed it to me if I had ever been near it. Two males and two females taken August 19th.

41. *Udeopsylla nigra* Scudd. I have found this species not uncommon in woods from the first to the middle of June.

42. *Ceuthophilus maculatus* Say. A rare species at Moline, a few specimens taken in June.

43. *Ceuthophilus latens* Scudd. Not uncommon in the latter part of June.

44. *Ceuthophilus niger* (?) Scudd. I have a single immature specimen which I refer to this species.

45. * *Ceuthophilus gracilipes* Scudd. Mr. S. H. Scudder gives Southern Illinois as a locality for this species. I have not identified it.

MARINE INSECTS. Those interested in this somewhat restricted field will find in last year's *Revue biologique* of Lille an interesting contribution to the subject by Prof. R. Moniez, entitled *Acariens et insectes marins des côtes du Boulonnais*. Six species of *Thysanura* of four genera, one of *Coleoptera* (*Micralymma*) and one of *Diptera* (*Chironomus*) are recorded.

THE TRUSTEES OF DARTMOUTH COLLEGE have recently established in the agricultural department a chair of entomology and zoölogy, and filled it by the election of Dr. Clarence M. Weed, now in charge of the entomological department of the Ohio Experiment Station at Columbus. Professor Weed is also editor of the entomological department of the *American naturalist*.

ON THE LIFE-HISTORY OF *DIABROTICA 12-PUNCTATA* OLIV.

BY H. GARMAN, LEXINGTON, KY.

This insect is deserving of especial attention just now because it appears to be undergoing a change of habit similar to those undergone in the past by several other native American insects, and probably due to the destruction, by the cultivation of land and by grazing, of the wild plants upon which it has hitherto subsisted. This explanation of its sudden appearance recently over a wide extent of territory as a corn-infesting insect seems to me the only one warranted by the published facts of its history.

Until 1888 *Diabrotica 12-punctata* did not appear in the literature of economic entomology as an important enemy of any of our staple crops. Mr. B. D. Walsh, writing in 1866 (Pract. ent., v. 1, 110) and referring to the beetle, states that "it is very injurious to flowers especially to Dahlias," and infers that it is in part responsible for an injury to the leaves of melons, cucumbers and other plants, of which one of his correspondents complains.

In 1868 Walsh and Riley (Am. ent. v. 1, 227) in reply to a correspondent in Bushberg, Missouri, wrote of the same beetle, "The yellow beetle with twelve black spots which we herewith illustrate (Fig. 168, twice natural size) and which has been so destructive to your water melons and Hubbard squashes, is the 12-spotted *Diabrotica*." In the same

place in reply to R. D. Parker of Manhattan, Kansas, these authors state that insects sent to them for determination are also *D. 12-punctata*.

In 1870 Prof. C. V. Riley (2d Missouri Report, 66) wrote that the beetle "may often be found embedded in the rind of both melons, cucumbers and squashes," a statement which is repeated in 1872 by Mr. E. B. Reed (Ent. soc. Ont., Report for 1871, 91).

Prof. S. A. Forbes somewhat extends the knowledge of the food-habits of the beetle by recording in his first report as State Entomologist of Illinois (p. 104) that it was observed Aug. 1, 1882, feeding on the pollen of corn and on the blossoms of clover.

One of the most notable cases of injury by the beetle is that reported in 1888 by the editors of *Insect life* (v. 1, 58). In an orchard at Hernden, Virginia, planted chiefly in 1887, young apricot and plum trees are stated to have been badly injured in late April and early May by the beetles, which devoured the leaves as they unfolded. The land on which the trees were planted was mostly in corn in 1887, but a half acre had been in melons. In concluding their notice the authors use the following words:

"It is safe to say, however, that this occurrence is exceptional, and that it depended almost entirely upon the peculiar circum-

stance of a young orchard having been planted close to a last year's melon patch, which was not replanted this year. The beetles undoubtedly bred upon the melons last season and hibernated in large numbers. The present spring, finding no more appropriate food at hand they took to the young plums and apricots merely as a substitute. We have little fear, therefore, that a new habit has been formed."

What basis the authors had for the positive statement that the beetles bred upon the melons I am unable to say, but it is more than probable from what is now known of the life-history of the insect that many of the beetles had developed instead on the roots of the corn.

These references and quotations will serve my purpose of presenting the insect as it was known to entomologists during the time which they cover. It is to be noticed that no reference is made to the larva except that implied in the statement made by the editors of *Insect life* to the effect that the beetles breed upon melons. If these authors had known at the time their notice was written that larval *Diabrotica 12-punctata* feed on the roots of corn we may assume that they would have mentioned it in reporting a case in which the relation between the injury to the trees and the corn-infesting habit is so evident.

During the years 1882 and 1883 Prof. S. A. Forbes made a thorough study of the related *D. longicornis*, which affects the roots of corn in Illinois and other middle states. In this region *D. 12-punctata* is a very common species, occurring everywhere in gardens and

fields on flowers. With the thorough examination of insects from the roots of corn which to my knowledge was made by him, it is altogether unlikely that it would have escaped notice if its larvae had then been present in any numbers in corn fields.

In the report for 1887 (published in 1888) of the Entomologist of the National Department of Agriculture, Mr. F. M. Webster states in a brief notice that while in Louisiana in 1886:

"We frequently heard of fields of young corn being seriously injured, during some seasons, by a small white worm which attacked the roots, usually during April. From the description given us of the pest and its manner of attacking the plants, we first thought it might be the larva of *D. longicornis*, as the habitat of that species is known to extend southward to Central America. On April 12 of the present year [1887] we were enabled to solve the problem by finding considerable numbers of these larvae in a field of corn in Tensas Parish, La., where they were working considerable mischief by killing the young plants. As observed by us, their mode of attack differed from that of their northern congener in that they did not appear to attack the fibrous roots or bury themselves in longitudinal channels excavated in the larger roots. On the contrary, they burrowed directly into the plants at or near the upper whorl of roots, which almost invariably resulted in the death of the plant. . . . Both of these fields had produced cotton the preceding year. The adult beetles were frequently seen before we observed the larvae, but they were not abundant about the plants in the corn fields, being usually on the yellow blossoms of a species of *Aster* which springs up in cultivated grounds early in the spring in great abundance. No pupae were found, although careful search was made for them."

The above is the earliest notice of *D. 12-punctata* as a corn insect of importance which I have seen. Unfortunately the writer does not state whether his conclusion as to the author of the injury was the result of inference, or was arrived at by carrying the larvae through their transformations. From the fact that he had not found pupae up to the time of writing, it is proper to assume that the transformations were not observed. As a possible clue to one of the original food-plants of the larva attention is directed to the fact that he found the beetles abundant on an *Aster* growing on cultivated ground. (From its yellow color the plant would appear to belong to some other genus.) If, as is not unlikely from an observation made by Prof. Lugger and reported farther on, the plants observed by Mr. Webster are attacked by the larvae, the fact may have an important economic bearing.

During the years 1889 and 1890 the injury from larvae to corn attracted attention over a wide area of country. To my knowledge it has been witnessed in Virginia, Alabama, Mississippi, Louisiana, Arkansas, Kentucky, Illinois, Indiana and Ohio.

My own observations began July 15, 1889, and have continued, as other work permitted, to the present time. A brief notice of the insect, its habits and stages, was printed in the *Louisville Home and Farm*, Sep. 1, 1889, and in November of the same year was followed by a more elaborate account of the transformations and descriptions of the stages, presented before a meeting of the Association of official economic entomologists at Washington. (See *Insect life*, v. 2, 179.) The latter paper is embodied in what follows, with the addition of observations made during the winter of 1889-90, and the spring of 1890.

(*To be continued.*)

THE PARTIAL PREPARATORY STAGES OF HETEROPACHA RILEYANA HARVEY.

BY G. H. FRENCH, CARBONDALE, ILL.

In 1887 I found larvae of this species feeding on the honey locust in two stages of their growth. At the time I was feeding quite a number of other larvae and did not make so full notes of these as could be desired, but what I did make are as follows:

Length, .45 inch. The body flattened beneath, the back rounded, head small, a fringe of white hairs on each side of the body. Color

reddish brown with an indistinct dorsal stripe of a more distinct red, a stigmal blackish stripe; head black, with a longitudinal fulvous line each side of the middle and a transverse line of the same about the middle of the front.

Next to last stage:—Length at moult .60 inch. Shape as in the preceding. Brownish red on the dorsum, but joints 8 and 9 gray on the sides leaving only a narrow dorsal brownish red stripe; joint 6 gray but less distinct,

the whole side gray tinged and the borders of the dorsal stripe of clear color outlined by gray touches; a dorsal line of clearer color indicated on the anterior joints; between joints 3 and 4 and between 4 and 5 on the dorsum a yellow transverse stripe that is hid when the larva is at rest; the head is less distinctly marked than at the other stage; the lateral fringe pink tinted. The dorsal stripe is more of a distinct red than the general ground color.

An interesting parasite was bred in this stage from one of these larvae, but at the time of writing it is misplaced so that I can not now say what it is. Its manner of pupation was as follows: When ready to spin its cocoon it burst open the under side of the host so that the skin of the dead *Heteropacha* larva formed a cover for the upper side of the cocoon. The ends of the dead larva were shrunken, but the middle where used as a cover for the cocoon was three times as broad across as the living larva had been. The pupal period of the para-

site was 8 days, from May 20 to May 28.

Last stage—Length, 1.05 inches. Striped with 7 yellow stripes, a dorsal, subdorsal, suprastigmatal, and substigmatal, the first two quite dark almost orange, the other two paler and much narrower. The space between the dorsal and subdorsal black; a white patch between the joints breaks the subdorsal stripe and extends almost to the dorsal. Sides gray. Venter pale yellow, dull, a black patch to each joint. Head black, a short transverse buff streak in front; top of joint 2 black; short hair all over the body but not enough to very much obscure the colors, the hair on the upper part of the body mostly black but that along the sides above the legs gray.

The pupal period of the moth was 15 days, from May 22 to June 6. This was the period of the first one that pupated. Several others were raised but their periods were not noted. They continued to hatch to July 17, some being in the larva state when the first one emerged as an imago.

SMERINTHUS ASTYLUS.—A brood of twenty-four raised this past season, showed some variations from those of last year.

Eggs laid July 29th and 30th.

Hatched—Aug. 8th.

1st moult—Aug. 16th.

2nd moult—Aug. 22d.

3rd moult—Aug. 29th.

4th moult—Sept. 5th.

Most stopped eating Sept. 14th, and pupated Sept. 18th to 30th, varying much in length of time required for this change. All these periods were shorter in 1890 than in 1889, except that between 2nd and 3rd moults. But three of the larvae kept on feeding till Oct. 15th—one dying just before that date. There was much greater variation

in color in this brood. Twenty were much more marked with red than those of last year, while four had no red, even on the caudal horn! Three of these four were the three which continued feeding after the others had pupated. Every one lost the "bifid tip" of the caudal horn so that, in the last stage, no one could imagine that it had ever been bifid. *Ida M. Eliot, Caroline G. Soule.*

PROTHORACIC WINGS.—M. Charles Brongniart of Paris has just published in the Bulletin of the Société philomathique two plates representing three insects, differing considerably in structure, found in the rich carboniferous beds of Commentry, France, two of which show, besides fully developed meso-

thoracic and metathoracic wings, a pair of prothoracic wings, bearing much the same relation to the others as the mesothoracic tegmina of tropical Phasmidae bear to their metathoracic wings. They are short subtriangular lobes having a well defined basis which is narrower, sometimes much narrower, than the parts beyond, and from which course three or four radiating nervules. Although on these individuals these parts spread laterally like the wings behind them, and are sometimes so broad at base as to appear at first sight rather as lateral lobes of the prothorax (especially in an English carboniferous insect described by Woodward, which Brongniart also places here) M. Brongniart believes that they were movable and could be extended backward along the body, so as to cover the base of the mesothoracic wings. As to the question which naturally arises, whether these members are to be regarded as atrophied organs and therefore presuppose a progenitor equipped with three pairs of fully developed and similar thoracic wings, M. Brongniart prefers to wait for further paleontological facts. One recalls in this connection the discussion between Haase and Cholodkovsky in the *Zoologischer anzeiger*, Nos. 235, 239 and 244.

A HINT FROM EMBRYOLOGY.—Mr. Wm. M. Wheeler has enriched entomology by a very interesting and suggestive paper on the appendages of the first abdominal segment in insect embryos (*Trans. Wisc. acad. sci.*, v. 3, pp. 87-140, pl. 1-3). Besides his own observations on *Phyllodromia*, *Periplaneta*, *Mantis*, *Xiphidium*, *Cicada*, *Zaitha* and *Sialis*, he gives a résumé of the observations of others and discusses the probable original function of these appendages among the ancestral insects when they must have extended to postembryonal life. Showing that in view of their origin from the ectoderm they must have been either respiratory organs, sense organs, or glands, he reviews the arguments for each hypothesis pro and con

and concludes in favor of the last; he is further inclined to regard them as having probably been odoriferous glands and his ingenious arguments in favor of this view will be found of interest to all entomologists. He proposes for these organs, which he notes to have been found only in the *Heterometabola*, the name of *Adenopodia*, a name which demands the acceptance of the glandular hypothesis. Considering the variety that he shows has already been found in the nature of the *adenopodia*, a fruitful field of investigation is opened, in which there is plenty of room for many workers.

KOLBE'S INTRODUCTION to the study of insects is slow in publication. Begun early in 1889, it was to be completed in six or seven small monthly parts. The fifth part has just appeared and the second of the twelve divisions of the book is not half finished, so much more extensive is our author's performance than his promise. The present part (pp. 225-272) deals with the mouth-parts of the sucking insects and the structure of the wings. In the former, under the bibliography of the *Lepidoptera*, we miss reference of any kind to either of Edward Burgess's papers, the most important ever published. In the latter there is no reference to Saussure's paper on the folding of the wings of cockroaches, but there will be found a good account of Adolf's views. There are 23 wood-cuts in the text of this part, mostly original.

DR. ANTON FRITSCH of Prag, has recently described in *Vesmir*, a popular Bohemian journal of natural history, the case of a caddis fly from the permian formation, and it may be regarded as the oldest indication of the *Phryganidae* yet brought to light.

EGGS OF LYCAENIDAE.—Doherty of Cincinnati has carried the study of the eggs of eastern *Lycaeninae* so far as to propose, in the *Journal of the Asiatic Society of Bengal* for 1889, four divisions to the *Theclini*, based principally upon characteristics drawn from

the egg, though he points out several accompanying features in the adult. They are as follows:—

- Egg large, tubercular, indentations obscurely hexagonal *Aphnaeus group*.
 Egg similar, not tubercular.. *Loxura group*.
 Egg small, tubercular, indentations sharply cut, usually trigonal *Thacla group*.
 Egg small, spiny, indentations sharply cut tetragonal *Arkhopala group*.

PROCEEDINGS OF SOCIETIES.

CAMBRIDGE ENTOMOLOGICAL CLUB.

10 February, 1888.—The 135th meeting was held at 61 Sacramento St. Mr. S. Henshaw was chosen to preside, and Mr. G. Dimmock chosen secretary pro tem.

Mr. Roland Thaxter of Cambridge, Mass., was elected to active membership.

Mr. J. H. Emerton read his address as retiring president, having been unable to be present at the January meeting. The address was entitled "The study of species and the study of cells" (see *Psyche*, v. 5, p. 77-78).

Mr. C. W. Woodworth exhibited his collection of North American Cicadidae, which contains all the described species. Numerous notes were given upon the distribution and other peculiarities of each species.

Mr. J. H. Emerton showed mites taken from a lizard and made some remarks upon their peculiarities.

Mr. Emerton also showed drawings of the cribellum and calamistrum of various species of Ciniflonidae. These organs are used by these spiders for curling their web to make it sticky. He also showed drawings of the feet of certain species of spiders.

Mr. S. Henshaw showed a fine specimen of a vegetable parasite (*Sphaeria*) from a

New Zealand species of *Cossus* or *Hepialus*.

Dr. H. A. Hagen spoke of the early stages of the Odonata and especially of a pupa skin of a large *Libellula* from China that he had lately examined. In this species the palpi did not meet, but each had five or six teeth comparable to a comb. Otherwise the insect belongs near *Macromia*, and this peculiarity of an earlier stage furnished the text for a discussion of how far position in classification should be governed by the earlier stages of animals and how far by adult characters only. The discussion was participated in by several members.

9 March, 1888.—The 136th meeting of the Club was held at 61 Sacramento St. Mr. J. H. Emerton was chosen chairman.

Mr. S. H. Scudder invited the Club to hold its meetings hereafter at his laboratory, and offered shelf room for its library; both offers were accepted with thanks.

Mr. J. H. Emerton spoke of Mr. McCook's observations on the habits of *Mygale hentzii* while kept in confinement (see *Psyche*, v. 5, p. 55).

Dr. H. A. Hagen said that a specimen of *Ixodes* in his possession, taken from the ear of a man in July, 1887, was still living, though it had been without food for a period of nearly eight months.

Mr. S. H. Scudder showed a series of maps giving the distribution of New England butterflies, and called attention to some curious points in the range of several species.

Mr. C. W. Woodworth described retractile processes on the abdominal segments of the larva of *Craesus latitarsus*, and suggested that they were probably defensive in function. Discussion on similar organs followed.

Dr. H. A. Hagen spoke of the larva of *Glyptus sulcatus* found in the nests of white ants in south Africa.

13 April, 1888.—The 137th meeting of the Club was held at 156 Brattle St. Mr. S. H. Scudder was chosen chairman.

Mr. C. W. Woodworth recorded the capture in the south-western states of *Atractocerus brasiliensis*. The venation is peculiar, bearing a closer resemblance to that of the Meloidae than to that of the Clavicornes. The species is distributed from Brazil to Mexico, and this specimen, if taken in the United States, is probably from Texas.

Mr. S. Henshaw thought the label rather suspicious. He stated that Gorham says in the *Biologia Centrali-Americana* that the large size of the eyes and readiness with which this insect flies to the light indicate parasitism.

Mr. Woodworth stated that on pressure being applied to *Camponotus pennsylvanicus* a drop of what was apparently water was exuded from the alimentary tract.

Mr. S. H. Scudder read a paper on the distribution of *Anosia plexippus*.

Dr. H. A. Hagen stated that a species named by him as *Libellula vacua* was identical with *Cordulia lintneri*, and has occurred in Manitoba and the northwest and at Centre, N. Y. He also said that *Aeschna grandis* which has been taken at Hoboken also occurs in Ontario.

Mr. S. H. Scudder remarked on the analogy which the distribution of *Cordulia lintneri* bore to that of *Rusticus scudderii*, which occurs in Labrador, Manitoba, the Saschat-chawan up to Great Slave Lake, and also at Centre, N. Y.

11 May, 1888.—The Club met at 156 Brattle St. Mr Samuel Henshaw was chosen chairman and Mr. S. H. Scudder, secretary.

Dr. H. A. Hagen exhibited illustrations and specimens of the early stages of the species of *Blepharocera* which Fritz Müller has found living in rapid currents in southern Brazil, remarkable for the suckers attached to each segment of the abdomen, by which it is enabled to withstand the rapidity of the stream. Dr. Hagen also gave an account of our knowledge of the history of the several species and in the same connection exhibited the larvae of *Blepharocera* found by Mr. H

G. Hubbard in the streams of Michigan.

Dr. Hagen also announced the discovery of the larva of an unknown species of *Sisyra* in northern Illinois, and offered some remarks on the peculiar structure of this larva.

Mr. C. W. Woodworth mentioned finding a very interesting larva of *Stratiomys* which used its palpi as locomotory organs.

Mr. S. H. Scudder called the attention of the Club to the completion of the Rev. Mr. Eaton's monographs of the Ephemeridae, the last part of which had been received within a few days. A discussion ensued, in which accounts were given of the immense numbers of single species of Ephemeridae sometimes seen.

Mr. Scudder also exhibited a *Hemerobius* taken in the house since the last meeting, in which, contrary to what is customary in the Hemerobidae, a cross vein united the subcosta and radius near the tip, though the neurulation of the two wings of the specimen did not agree.

He also read from his forthcoming work on New England butterflies a chapter on the life-history of *Anosia plexippus*, with special reference to the annual recolonization of New England from the south.

Mr. Woodworth gave an account of species of the group *Typhlocybidæ*; five genera are known in the whole world, all of them found in North America, where we have about thirty species.

Mr. Holmes Hinkley stated that he had obtained an immense number of cut worms from a greenhouse adjoining his residence, where they were now appearing upon the surface every night, attacking the pansies and geraniums, and were supplied to him in large numbers by the proprietor.

The librarian announced that the Club's library was now stored and arranged on shelves in a room adjoining that in which the meeting was held, where they will be kept for the present, and be accessible to the members on every Tuesday evening as well as at the Club meetings.

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PSYCHE.

A GENERAL SURVEY OF THE MODES OF DEVELOPMENT IN INSECTS AND THEIR MEANING.*

The mode of development in all of the first series of orders from I-IX [see *Psyche* v. 6, p. 13] is as a rule direct, and this necessarily unites the Thysanuriform larva, when it is present, more or less closely with the adult stages, and the adults are apt to show traces of this connection in the retention of certain primitive characteristics. The absence of a waist or deep constriction between the thorax and the abdomen is due to the fact that the junction with the metathorax remains in most adults as it is in the larva and in Thysanura. The mouth parts also are for biting, except in the highly specialized Hemiptera, in which, although the suctorial characteristics of these parts are developed early, the larvae, with this exception, have what may be called a Thysanuriform stage. The highly specialized adults of groups having indirect development (Coccidae) are not exceptions to this rule, and retain to a recognizable degree the primitive form of the larvae.

The second series of orders from X-XVI have, as a rule, more complicated modes of development, introducing various intermediate and often extraordinary stages, such as grubs, caterpillars,

etc. Following Brauer and some other entomologists, we have regarded these as more or less degraded modifications of the primitive Thysanuriform larva, but have spoken of them collectively as the secondary larval stages. They appear subsequently to the Thysanuriform stage, when that is present, or between the ovarian and pupal stages when that is absent. The pupal stage is similar to that of the first series of orders in all respects except that, as a rule, it is incapable of motion, or is what is called quiescent, and is usually more or less protected. The complicated development of individuals in the second series of orders has led several authors to designate the first series of orders as Ametabola, and the second series as Metabola.

The use of the term "ametabola," as applied to the orders from I to IX, involves an exaggeration, since it implies that they have no metamorphoses; whereas, as pointed out by Comstock and others, the Coccidae have a "complete" series of metamorphoses, or indirect development, even including a quiescent pupal stage in the development of the only winged form, the male. The quiescence of the pupal stage loses much significance in view of

* From *Guides for Science Teaching*, No. VIII. By Alpheus Hyatt and J. M. Arms.

this exception, and also when it is noted that an extra quiescent larval stage may occur in the second series of orders, as in some beetles, whose extraordinary habits render two quiescent stages essential in their development.

It is a remarkable fact that, as a rule, the larvae of the second or specialized series of orders have the habit of feeding voraciously. In this way the larvae store up fats and food matters in their own bodies in preparation for the quiescent and helpless pupal stage, during which they live upon these accumulations, they being taken up by the cells of the tissues and used in building up the organs and parts of the adult. The pupal stage is passed, as a rule, in more or less sheltered situations, and it is either enclosed in a special covering, a cocoon, woven by the animal, or else protected by one acquired through the moulting and hardening of its own cuticle. The difference between this last and the ordinary process of moulting consists in the retention of the moulted skin, the animal shrinking within it for shelter as its fatty parts are consumed, instead of casting it off altogether.

Lubbock, in his *Origin and metamorphoses of insects*, has shown that the inactivity of the pupa in the second series of orders is not a novel condition, but a mere prolongation of the shorter periods of inactivity which necessarily accompany every change of skin or moult. These facts and the obvious want of any common structural differences in the quiescent pupae, as compared with the similar stages of ac-

tive pupae, show that quiescence must be reckoned as a habit of resting from active exertion during a more or less prolonged period of their growth which has been acquired by the more specialized forms of insects, not only generally among the members of the second series of orders, but also by many among the first series. The degraded larvae of individuals in these specialized forms are as a rule farther removed structurally from their own adults, than in forms having a direct mode of development, and the changes to be gone through before reaching the adult stage are greater and more numerous. The habits of the animal during the pupal stage have consequently changed in proportion to these requirements from the active to the quiescent condition.

There are other series of facts equally important and significant. While the Thysanuriform stage is present more or less in Coleoptera and Neuroptera, which have the indirect mode of development, it is absent in the orders from XII to XVI inclusive, having been replaced by the secondary larval stages in accordance with the law of acceleration in development.

The tendency of the more specialized forms in the orders I to IX to accelerate the development of the earliest stages is shown in various ways. In the grasshoppers,* Mantidae, etc., the inheritance of the adult peculiarities of the type affects the young at such early

*Packard's illustrations on p. 60 of his *Entomology for beginners* give an excellent series of one species, *Caloptenus femur-rubrum*

stages that, as has been described above, the primitive larval Thysanuriform stage is skipped or omitted from the development.

In Coleoptera and in the highly specialized orders of insects (XI to XVI) a novel and disturbing influence appears, due to the extraordinary importance of the functions of larval life. This period in the larger number of groups in other classes of animals is much less variable than the adult stage, and it is really very often a mere vehicle for the record and transmission of hereditary characters. In some of the orders of insects, however, it is as efficient for the manifestation of new modifications and adaptive characters as the adult, and often perhaps more variable. This is an exceptional rather than the usual aspect of the larval stages, and makes the study of insects remarkably difficult and interesting.

Sometimes in the orders I to IX (Coccidae, Cicada), as well as more generally in X to XVI, the larvae carry the line of development and modification a long way outside of what can be termed the normal or direct course, but these deviations lead, as a rule, back again through similar pupae to the same goal in the imago, a typical adult insect. *Epicauta*, the blister-beetle, is a good example. Fig. 98 shows the active Thysanuriform larva, and Figs. 102, 106, 107, the grub-like larva which passes through two stages before becoming the true pupa that transforms into the imago. These complications were probably due originally in

each type to the plastic nature of the organism, which enabled it to fit itself to different conditions and surroundings during its passage through the younger stages of growth. The history of parasites, whose loss of parts and correlative modifications are plainly adaptations to the nature of the surroundings in all branches of the animal kingdom, shows this to be sound reasoning. Among some of these types there are all kinds of metamorphoses and very complicated modes of development, so that it is not difficult to surpass even those of insects. One can apply a similar nomenclature and the same laws in explanation of the often curious and sometimes extraordinary metamorphoses, and these changes are often, as in *Taenia*, accompanied by corresponding acceleration and loss of primitive stages. The curious transformations of Echinodermata are plainly adaptations of the larvae to a free life in the water before they become attached or sink to the bottom and begin their proper life as crawlers. In this class there are a number of examples of acceleration (*Comatula*, *Spatangoids*, etc.). Such life-histories and those of *Epicauta*, *Sitaris* and *Meloe* among beetles which run out the gamut of changes from the simplest Thysanuriform larva through several grub stages to the quiescent pupa, show that the most complicated metamorphoses, called hypermetamorphoses by entomologists, must have arisen in response to the changes of the surroundings. No other hypothesis can account for the number, variety, and novelty of these metamor-

phoses and their suitability to the number, variety, and novelty of the changes in the surroundings and the corresponding changes in habits of the larvae at different stages of growth.

The occupation of the larval stages by strange and curious forms, like caterpillars, grubs, etc., naturally attracts attention and at first makes one wonder at the apparent eccentricities of nature's ways. But in reality they serve to throw a strong side light upon the normal mode of action of the laws of heredity, and show us that, in spite of its enormous conservative force, heredity is subservient to the effects of habit or use of parts.

That these secondary larval forms are more reduced, although more specialized organisms than the primitive Thysanuriform larvae, has already been stated. Among Coleoptera and Neuroptera this is obvious whenever the Thysanuriform and secondary adaptive forms are present in the growth of the same individual. No one can compare the swollen, soft, round-bodied grubs with the active Thysanuriform larva, especially when occurring in the growth of the same beetle, without realizing that the former is due to specialization by reduction. That their structures, although degraded by this process, are suitable to the conditions under which they live has been pointed out by many writers; notably, Graber, Riley, Lubbock, and Packard. This reduction becomes still more apparent when we regard the larvae of Diptera and the grubs of the weevils among Coleoptera,

the latter being generally without legs, and the former also deficient in these organs and in large part without a differentiated head. If these or the caterpillars or other secondary larval forms similar to them were isolated, and their subsequent development into pupae and adults unknown, naturalists would not admit that they possessed close affinities with the adult insects of the same groups, and they would be considered as more rudimentary or simpler in structure than any Thysanuran or Thysanuriform larva. In the most specialized forms of Coleoptera, the weevils, the early development of a footless grub, a reduced form similar to the maggot of the Diptera, replaces both the Thysanuriform larva and also the active six-footed grub of the normal groups of beetles. The Insecta furnish such apparently isolated examples, and, on account of the absence of intermediate forms, it has been supposed that these could be put in evidence against the derivation of the orders of which they were members from Thysanura, as has been stated above with reference to the saltatorial Orthoptera, but the researches of Brauer, Packard, and Lubbock, demonstrating that the secondary larval stages, grubs, maggots, etc., are modifications of the Thysanuriform larval stages, show that this use of them cannot be admitted. If this be granted, it becomes possible to account for the phenomena as follows. The modified, and adaptive, larval characters of the grubs, caterpillars, etc., having become fixed in the organization of such groups as

the weevils among Coleoptera, and in some whole orders, as in the Lepidoptera and Diptera, have been inherited at such early stages in accordance with the law of acceleration in development that they have replaced the useless Thysanuriform stage. In other words, the absence of this primitive larval stage in the young of many specialized forms of insects now living is due to the tendency to earlier inheritance of the later acquired, adaptive characters of the secondary larval forms.

It is very important for these considerations to notice that after the insects possessing the indirect modes of development have passed through their reductive secondary larval stages, they return to the more normal or direct mode of development in the pupa. In doing this, they clearly illustrate the exceptional and adaptive nature of their deviations from the direct mode during the larval stages, and show that this resumption of the older beaten path marked out by heredity is essential in order that a typical hexapod form may be evolved in the adult stage. The pupa is always a six-legged form, with the legs more or less developed, and being common to all insects, whether quiescent or active, is really a part of the direct mode of development wherever it occurs. It is as universal and essential as are the typical ovarian and adult stages. Indirect development is, therefore, composite. It is first a deviation in the larva from the direct mode, and then a return in the pupa of the direct mode, and this return necessarily

brings the organism back again into the normal line of evolutionary changes, and the normal form of insect is the result of this return and the resumption of progressive specialization.

The reverse of this process, *i. e.* when direct development is not resumed, is shown in the case of parasites like the female of *Stylops*.

If it be true that the stages of development in individuals are abbreviated records of the modifications undergone by the group during its evolution in time, and that as a rule the characteristics of adults of the more generalized or primitive forms of any order, or even of smaller divisions, in all groups of the animal kingdom, show a tendency to occur in the young of more specialized forms of the same group or division, it follows, that in each natural group the specialized forms have been evolved from the generalized forms. This tendency to accelerate and abbreviate the record preserved by heredity in the growth and development of each individual can be understood if one imagines a series of forms evolving in time. First, the representatives of the simple, primitive ancestor; then one form after another coming into being successively would each introduce some novel modifications, according to its place in time and the structural series. These modifications being inherited at earlier stages in descendants than those in which they originated in the ancestral forms, would crowd upon the characteristics already fixed by heredity in the growth of the young. By and by, as characteristics

accumulated, it would become not only inconvenient to repeat all the characteristics of its ancestors, but it would be a physical impossibility for any individual to reproduce them all in the same succession in which they had arisen; life would not be long enough nor vital powers strong enough to accomplish such a process. Nature provides for such emergencies by a law of replacement; and as stated above, when a part or characteristic becomes useless, if it stand in the way of the development of other parts or other characteristics of the same part, it is replaced to a greater or less degree by the newer and more useful modifications. This is the rule so far as relates to an ordinary normal series of forms when such a series can be traced with abundant materials through a sufficiently long period of geologic time, as has been repeatedly shown by Cope and one of the authors. Made confident by such experiences we do not hesitate to apply it to the insects where positive evidence of this sort is not yet forthcoming.

If this be correct, it is evident for example that the sucking-tube and other correlative internal modifications originated in the pupal or adult stages of the primitive Hemipteron, then became fixed in the organization of the order, and are now inherited at an early age, having replaced or driven out the ancestral, primitive, perhaps Thysanuriform mouth parts from the larval stage. The assumption that the sucking mouth parts originated in the pupal or adult stages is considered probable, because, al-

though there are many exceptions, characteristics usually originate in the later stages in other branches of the animal kingdom. In Lépidoptera and Diptera, which resemble the Hemiptera in having the highly modified mouth parts with a tubular arrangement, these characteristic peculiarities are confined to the later stages of development, and are not found in their larvae. The larvae of Hemiptera are also decidedly Thysanuriform, and that they originated from a modified Thysanuroid form having biting mouth parts in the larvae and sucking mouth parts in the later stages, seems to be indicated by this fact. We have already seen in such examples as the locusts, etc., that an earlier development in the inheritance of the characters of adults may effectually obliterate the Thysanuriform larva, and in the Coleoptera, Neuroptera, etc., that it is the earlier inheritance of the secondary larval characteristic which accomplishes this result. In no case do the pupal or adult characteristics become accelerated in development so as to replace the larval stage in the second series of orders except in parasites such as the parasitic Pupipara (ticks). The young are in some of these species born as pupae, and the ovarian and larval stages are passed within the mother.*

As a rule, then, the orders having in-

*Among the orders having the direct mode of development a similar case to the Pupipara is to be found in the plant lice. These being viviparous, the young are born in an advanced stage, and are in reality, although wingless, comparable with active pupae. In the case of the sexually perfect forms which emerge from pseudova, they are, according to Comstock, in a still more advanced condition.

direct modes of development do not show to any marked extent acceleration in the inheritance of adult or adolescent (pupal) characters, but, on the contrary, the characteristics of these later stages remain remarkably constant in the ages at which they are inherited. They do not encroach upon or replace the larval stage to any very marked extent, as in the examples cited above, among the Orthoptera or Hemiptera. This might be considered as fatal to the application of the law of acceleration, and this would be the case if that law were anything more than the expression for a general result of causes which underlie the action of heredity. One of these causes is what we have already expressed as a law of replacement.

Two modifications cannot occupy the same space, and the secondary larval forms having become fixed in the organization, they hold their own in the development of individuals against the encroachment of the pupal and adult characters by virtue of their suitability and the conservative power of heredity. The few cases in which acceleration of the pupal stages at the expense of the larval stages does take place in the second series of orders seem to show this, since they occur not in the normal forms having the ordinary habitat, but in parasites like the Pupipara.

Teachers who read Sir John Lubbock's interesting chapter on the Nature of metamorphoses will find opposite views expressed in regard to the rank of metamorphoses, and these may confuse them unless explained. He speaks,

on page 41, of the maggots of flies as belonging "to a lower grade" of metamorphoses than the grubs which have biting mouth parts and heads, and of the caterpillar as on a higher level than the vermiform larvae of Diptera and Hymenoptera. This, literally translated, means that larvae, like those of the grubs of most Coleoptera and Lepidoptera, have heads, mouth parts, and legs which have not yet suffered from reduction; but in speaking of these as "lower grade," Lubbock makes a mistake in systematic perspective. If, as he holds, the secondary larvae are all primarily the outcome of the Thysanuran form, they are all what he ought to call "higher grade," being more specialized and farther removed from this primitive insect standard than the larvae of the more generalized or first series of orders. The same and, we think, more philosophical mode of dealing with the facts leads to the corollary that among themselves the larvae of the more specialized orders are really "higher," if the use of this word is considered essential, or more specialized in proportion to the extent of their structural deviation from the Thysanuran standard. Thus the larvae of Diptera are, as a rule, more specialized than any other, and have to be set on the extreme left in our table on this account. The words "higher and lower grade" are extremely confusing, since they embrace three different classes of ideas,—anatomical and physiological facts and teleological notions. Nature leads us along lines of modification which sometimes rise

through continuous progressive specialization to more and more differentiated structure with correspondingly increased functional powers, or larger or different fields of work. At other times it may lead us in a wave line, which follows a devious course, rising part of the time through progressive specialization, and then falling for another period of time through specialization by reduction. If the animals under consideration be parasites, they may continue on this descending plane both in the growth of the individual and the evolution of the group. Nevertheless the resulting adult is not necessarily of "low grade" in any scientific scheme of arrangement founded upon the principles of evolu-

tion. It is, however, farther removed from the primitive type, and is extremely specialized. The use of the aesthetic terms "low" and "high" have come from a period in the history of our science when nature was made to assume a rigidly progressive aspect, each division of the animal kingdom representing a finger-post pointing towards the so-called perfect animal, man, each rising higher and higher in the scale of perfection whose standard was the human organization. Such artificial ideas revenge themselves, and words become their ready instruments, first to express what is false, and then to help in binding the mind with the conservative fetters of habit.

ON THE LIFE HISTORY OF DIABROTICA 12-PUNCTATA, OLIV.

BY H. GARMAN, LEXINGTON, KY.

(Concluded from p. 30.)

THE INJURY TO CORN.

The larva of this insect works much like its congener, *D. longicornis*, commonly destroying the roots, but often also working on the underground part of the stalk. The larva of *D. longicornis* often makes a longitudinal burrow in a root leaving little outward trace of its presence. The larval *D. 12-punctata* has not been observed to work in this manner, the roots being mined and channeled irregularly, often bored

through from side to side, or even completely devoured where the worms are abundant. Very few fields in Kentucky are entirely free from injury, and many are affected very injuriously, the damage being perceptible to casual observation in the retarded growth, and, as the seasons advance, in the prostration of infested corn by the winds. As a rule the injury is greatest on land that retains moisture longest. On high and well-drained land it is not so prevalent. In

all these respects it agrees with the related corn root-worm of the North.

I have not observed thus far that its abundance has any relation to the land having been previously in corn. The northern species, it will be remembered, is commonly most abundant on old corn land. Two of the worst infested fields examined in 1889 were, one in tobacco, and the other in oats, in 1888. A third field, in corn in 1887 and 1888, was in oats in the spring of 1889, these to be followed the same season by a late planting of corn. This difference in the injuries of the two corn root-worms is to be attributed to the fact that *D. longicornis* hibernates in the egg state in the earth of corn fields, whereas *D. 12-punctata* hibernates, at least in great part, as an adult beetle which wanders actively about in fall and spring in search of food. Still, the observation reported in Insect life concerning injury to orchard trees planted on corn land renders it probable that in some cases beetles which develop in corn land hibernate there. This would certainly be the case at any rate if the corn was very late.

D. 12-punctata seems to be the only corn root-worm of Kentucky, and certainly is the only generally injurious one. During two seasons' collecting I have not found a single specimen of *D. longicornis* within the limits of the State.

LIFE-HISTORY (FOR KENTUCKY).

Young larvae noted on the 15th of July, 1889, were mostly grown, and some had pupated in small cells in the

earth by the 29th of the same month. Adult beetles dissected at this time contained numerous ova of relatively large size. On August 3 of that summer an examination of infested corn showed that most of the larvae had pupated or were ready to do so. No very young worms were seen. One adult was taken from an earthen cell where it had recently changed from a pupa. From the abundance of females with well developed ova about fields at this time it seemed probable there was to be a second brood. Subsequent search in the fields did not reveal young larvae there, and towards the end of August the females disappeared, and none were observed with developed eggs during the remainder of the season.

The eggs of these females were certainly not deposited freely among corn that was damaged by the early brood of larvae. What then became of them?

Several larvae and pupae, perhaps from eggs laid by these females, were found among injured corn late in summer, but thorough search at different times showed them to be rare, and I was for a time led to think the species might be single brooded like the related *D. longicornis*. But on the first of November, 1889, the discovery in a field of late-planted corn of numerous larvae together with pupae and recently transformed adults, gave unquestionable proof of at least two annual broods of the insect for this locality. The examples collected at this time were chiefly grown larvae, contracted and ready for pupation, with occasional individuals

about three-fourths grown, and a few pupae and recently emerged adults.

In my paper as read at the Washington meeting of entomologists I stated that the above facts made it seem probable that the late brood of larvae fed in part on plants other than corn. In the discussion following, Prof. Otto Lugger of Minnesota showed the surmise to be well founded by stating that he had taken pupae at the roots of one of the native Compositae,—a species of *Rudbeckia*. At my request he has since kindly given me the following definite statement, quoted partly from his notes :

"*Diabrotica 12-punctata*.—Sep. 3, '89, found among roots of *Rudbeckia* sp. three pupae of a chrysomelid, nearly ready to issue the imago. Sep. 5, '89, all three insects appeared above ground in breeding cage. At first white, they soon changed to the normal color, excepting that the black spots were only faintly visible. Sep. 7, '89, insects mature, and mounted. It is the above species.

Many specimens occurred at this time upon the above plant and upon *Solidago* and this tles. The majority appeared quite fresh, as if hatched quite recently. The *Rudbeckia* grew in an old field cultivated some four years ago, but grown up into a wilderness of *Solidago*, *Rudbeckia*, thistles, etc. The nearest field of corn is fully one-fourth mile from this spot."

Prof. Lugger's observation explains the whereabouts of most of the late brood. Very little corn is planted here as late as that in which the second brood occurred, so that ordinarily the beetles must resort to some other plant for oviposition. Five Kentucky species of

Rudbeckia are known, and in all probability the beetles which emerged from the ground in this vicinity during August resorted to these. The observation also renders it almost certain that the insect is two brooded at latitudes much higher than this.

The larvae and pupae in the field of late-planted corn were followed until all had completed their transformations. From an excess of larvae in November, the proportion was gradually changed to an excess of pupae in December. A short time spent digging about hills of corn on Dec. 5 resulted in finding seven pupae and two larvae. Subsequently we experienced a most exceptional period of spring-like weather, and urged apparently by its influence all the larvae and pupae completed their transformations. On January 16, a close search among the infested roots did not reveal the presence of a single example. Previous to December we had some weather during which the surface of the ground was frozen. If the winter subsequently had not been so mild it is safe to assume that the larvae and pupae in the frozen ground would not have changed to beetles until the spring of 1890.

The adult beetle has been found abroad at all times when looked for from July 10, 1889, until December, 1890. During the winter it is to be found among rubbish in strawberry beds, in gardens, and meadows. During mild days it is often awake, and feeds at such times on almost any green vegetation within reach. It is one of

the first insects to become active in spring, and at this time is to be found on grasses, clovers and other plants feeding on leaves, flowers or pollen. It is during this time, and before the corn is up, that the ova develops in the ovaries of the females. During the fall and winter those taken and dissected contained no developed eggs. In the latter part of May last spring when the corn was a few inches high, the females collected contained ova in an advanced stage of development.

I was unfortunately unable to find the eggs after oviposition, but there can be no doubt but that they are placed like those of *D. longicornis* in the ground at the roots of corn. A search in corn fields June 3, 1889, resulted in no larvae. On June 10, they began to appear, and by the close of the month were mostly well grown. On July 5 pupae were found in confinement from larvae brought in June 30. The pupae began to appear out of doors about the same time and the beetles came forth from them during the first two weeks of July, all apparently being out before the 21st. The first brood was thus matured earlier than in 1889, a result, doubtless, of the forwardness of the season of 1890.

REMEDIAL TREATMENT.

A complete remedy for the pest may prove hard to find. If the insect spent the winter in corn fields in the egg state, as has been determined by Prof. S. A. Forbes to be true of *D. longicornis*, we might hope to avoid injuries by

rotation of crops. Since it hibernates in part at least as an adult, and is capable of prolonged flight, rotation would not avail. The food habits, too, of larva and imago are such as to favor it in the struggle for existence. As a beetle it is a voracious and indiscriminate feeder, and nothing, seemingly, in the way of succulent vegetation comes amiss. Tomato leaves, clovers, potato leaves and tubers, turnips and cabbage have been used to feed beetles kept in confinement. During the latter part of August they are very common here in the ends of corn ears, eating out the silks. It is possible they may do some harm in this way, but I can not see that the affected corn fails to develop the usual number of grains. At times it is scarcely possible to find an ear of corn that does not harbor one or more beetles.

ENEMIES.

Some predaceous beetles and larvae have been found during summer and fall in the earth with young root worms, but not in any great numbers. Among birds I find only the brown thrush recorded as eating the beetles.

Several parasites occur in the fluids of the beetles, and can perhaps be expected to check any extraordinary increase in the numbers of the root-worm. The most common of these is one of the protozoans, a large Gregarina, probably the same species as that noted some years ago in the fluids of *D. longicornis*. The fluids of examples occasionally swarm also with a small nematode worm, and in one instance a large

thread worm with tapering caudal appendage was noted. Occasional beetles have been found affected with an Empusa resembling *E. grylli*, a species commonly known as a parasite of grasshoppers. An interesting bacterial disease of the larvæ reported by Prof. S. A. Forbes at the Washington meeting of entomologists is also to be mentioned in this connection, though I have not detected it here in Kentucky.

DESCRIPTIONS.

Egg. — Matured ova from ovaries of females are much like those of *D. longicornis*. They are white, oval, with the surface reticulated and sculptured so as to produce numerous hexagonal, pitted areas. Prof. Forbes gives the dimensions of the egg of *D. longicornis* as .025 inch, by .015 inch. Ova of the spotted species measure a trifle larger, being about .027 inch in length by .016 inch in greatest diameter.

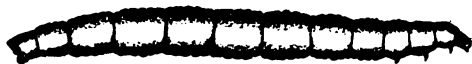


Fig. 1. Larva, enlarged.

Larva. — Body cylindrical, tapering a trifle towards the extremities, composed of twelve segments behind the head. Skin wrinkled, papillose along the sides, white, sometimes becoming yellowish just before pupation. Head dark brown, nearly black in some examples, with a few rather strong hairs arising from the surface; a narrow median longitudinal line of black above, and two pale lines which converge from the bases of the antennæ, following sutures, to meet at the middle line on the posterior part of the head; ventral side of head pale medially. No eyes. Antennæ of three segments, white. Labrum dark brown. Mandibles dark brown, black at tips, with four or more blunt denticles. Maxillæ pale, armed with

numerous strong spines within. Labium pale. Cervical shield pale brown, with a narrow median longitudinal white line, broadly triangular in shape. Jointed legs pale, each with a dark brown chitinous supporting frame work at base; each segment of legs provided with a number of strong hairs; a single brown tarsal claw, beside which arises a white, elliptical, striated plate slightly longer than the claw. Dorsal shield of posterior body segment nearly circular in outline, brown, with numerous minute black specks, slightly rimmed at posterior margin, and in young examples obscurely bituberculate; furnished with several strong marginal hairs, and with four minute, striate, centrally-placed, spatulate appendages. Spiracles round, the two anterior pairs sometimes with brown rims, the rest pale. Posterior segment with a single fleshy proleg.

Length about .56 inch, diameter about .06 inch. Examples ready for pupation about .37 inch long.



Fig. 2. Pupa, enlarged.

Pupa. — Translucent white, with scattered brown hairs on dorsal side of body arranged as follows: one within, and a pair posterior to, the base of each antenna; a transverse, arched row near the anterior edge, a pair near the middle, one at the middle of each side, and one at each side near the posterior margin, of the prothorax; four each on the meso- and meta-thorax; three at the extremity of each femur; a pair at the middle and one at each side of each abdominal segment, except the posterior three; antepenultimate and penultimate segments of abdomen each with six, the four inner being in pairs and

posterior to the others; two within, and three without each of the large spines borne on the posterior segment. Caudal spines straight or curved, black-tipped. Wing-pads covering the posterior femora below. Antennae curving around the femora of the two anterior pairs of legs and then extending inwards towards the ventral middle line.

Length .22 — .25 inch.



Fig. 3. Imago, enlarged.

Imago. — Pale green, or greenish yellow, marked with black. Head and mouth-parts black, the former showing a brownish cast medially on ventral side. Three basal articles of each antenna pale, sometimes with dusky dots on posterior side; remainder of antennae black. Prothorax uniformly green or yellow. Elytra green or yellow, with twelve large black spots, six on each, arranged in three cross series; the first series at the base, the second at about the middle, and the third midway between the second and the tips of the elytra. Scutellum brown or black. Mesothorax beneath, the coxae, the basal third to half of femora, and the abdomen, yellow or green. Metathorax beneath, the distal portion of the femora, and the whole of the tibiae and tarsi, black.

Head with a basal pit behind antennae. Prothorax above smooth and shining, obsoletely punctulate, with a pair of pits, one on each side of the middle line. Margin of prothorax sinuate at sides, no prominent angles. Elytra minutely, regularly punctu-

late, each elytron with a humeral prominence. Antennae, metathorax beneath, abdomen, and legs, clothed with a fine silken pubescence.

Length .25 — .28 inch; antennae about .19 inch.

For the purpose of making this record more nearly complete I may be allowed in conclusion to call attention to the most recent notice of *D. 12-punctata* known to me, printed in a recent number of *Insect life* (v. 3, 150). The writer, Mr. Webster, here gives a brief description of the larva which agrees in the main with that given above. In several points, however, we do not agree. I presume the statement that the posterior segment of the body is provided with a *pair* of prolegs is a slip of the pen; certainly there is only one of these in both *D. longicornis* and *D. 12-punctata*. The statement also that the brown plate on the hindmost segment is furnished with a ridge "bearing a long erect bristle" cannot be verified on the larvae collected in this State, and I respectfully suggest in explanation that in examples nearly grown some of the hairs on the plate are frequently worn or broken off. The hairs are constant in position and number in the examples I have studied, and none have been seen with a single erect hair arising from the ridge. If these differences in the descriptions are not thus to be explained away, then I submit that we have examined different larvae, and am content to leave to others the decision as to who has described the larva of *D. 12-punctata*.

DESCRIPTIONS OF NEW WEST AFRICAN LYCAENIDAE; PAPER II.*

BY W. J. HOLLAND, PITTSBURGH, PA.

THE following descriptions have been lying in my portfolio for some time, and I have been intending to add to them descriptions of a dozen or more other species which are manifestly non-descript, but finding no time at my command in which to execute this purpose, I herewith present them as they are. The insects all come from the region of the upper waters of the Ogové River in West Tropical Africa, and were captured by Mr. Good.

Pittsburgh, Jan. 31, 1891.

PSEUDALETIS Druce.

1. *P. zebra*, sp. nov. Upperside:—Head and thorax yellowish brown, abdomen white ringed with pale gray, and tufted at the anal extremity with fulvous. Anterior wings white, faintly laved near the base with stramineous, and narrowly bordered upon the costa and broadly bordered upon the outer margin with black, and further ornamented by three broad black bands, the first and shortest of which crosses the cell about the middle, the next is situated at the extremity of the cell, and a third, which runs from the costa about one-third of the distance from the apex, across the wing in the direction of the outer angle until it is fused with the broad black external margin. The posterior wings are white with a black border, narrow at the external angle and gradually increasing in width toward the anal angle. The tails are very small and black. Underside:—Thorax, abdomen and legs fulvous. Ground

color of the wings white. The anterior wing is marked as upon the upper surface except that the cell at the base is deeply black, the two outermost of the broad black bands are traversed in the middle by a narrow whitish line, while the white of the surface replaces the dark outer margin from the outer angle upwards for half of the distance to the apex. The fringe is black. The posterior wings are marked by a ray of dark brown running from the base along the submedian nervure about half way to the anal angle. Two faint brown lines run transversely across the wing in a direction approximately parallel to the outer margin toward the anal angle, and two similar lines run parallel along the inner margin and all converge in the neighborhood of the anal angle, which is broadly laved with yellow and marked by two small black spots at the points where the tails are given off. The outer margin is fringed with black. The markings of the underside of the posterior wings re-appear to some extent upon the upper surface. Type, ♂, in the collection of the author.

LYCAENESTHES Moore.

2. *L. scintillula*, sp. nov. ♂. Upperside:—Antennae, head, thorax, and abdomen black; wings lustrous orange-red with the costa of the primaries at the base and near the apex somewhat broadly margined with black, and the costa and the inner margin of the secondaries very broadly margined with the same color. The fringes of both wings are black and near the anal angle of the secondaries there are three small black spots, of which two are marginal, and the third is situated above the one nearest the anal angle and is subhastate in form. Underside:—

* For Paper I see *Psyche*, v. 5, p. 423.

Ground color pinkish white with the wings barred and mottled by spots of brown and black. Near the anal angle of the secondaries are two red marginal spots pupilled with black, irrorated with greenish-blue scales. Expanse of wings 25 mm.

Types, four ♂♂ in collection of author and one ♂ presented to the British Museum. (*Lycaenesthes scintillans* Holland, MS.)

3. *L. regillus*, sp. nov. ♀. Upperside dark fuscous with white spaces and black spots. The white spaces are located just beyond the cell and between the median nervules upon the primaries, and are disposed in the form of a marginal band upon the secondaries. Both wings have a conspicuous black spot at the end of the cell defined inwardly by a narrow white line, and succeeded externally by a transverse series of similar spots. The primaries have in addition two subbasal spots of black. Both wings are bordered heavily with black and the posteriors have in addition geminate white marginal lines. Underside:—The ground color of the wings is white. The markings have a general likeness to those of the preceding species, but owing to the lighter ground color of the wings they are more conspicuous. Expanse of wings 25 mm. Type, ♀, in collection of the writer.

It is barely possible that this is the female of *L. scintillula*, but I hesitate to declare it such and name it provisionally.

4. *L. lychnaetes*, sp. nov. Allied to the two preceding species and to *L. leptines* Hew.

♂. Upperside:—Antennae, head, thorax, and abdomen black; wings shining orange-red, the anteriors with the costa broadly and evenly bordered with black and the outer

margin bordered with the same color, the width of the border gradually diminishing from the apex to the outer angle. The posterior wings are broadly bordered with black upon the costal and inner margins, and narrowly upon the outer margin near the anal angle. Underside:—The ground color of the wings is black, both have black fringes, both have narrow, geminate white marginal lines, and both are traversed by irregular series of more or less broken narrow white lines. The posterior wings are adorned with a small black spot at the extremity of the first median nervule, crowned with red and irrorated with blue scales, and with a similar black spot at the end of the submedian nerve. This latter spot is not crowned with red.

Expanse of wings 20 mm. Types in collection of the writer.

There is a female which is upon the under surface almost the exact counterpart of the male just described, but the upperside of the wings is almost uniformly blackish brown. Whether this is the female of *L. lychnaetes*, or not, it is impossible to tell at this time, though the presumption is that this surmise as to the relation of the two forms is correct.

5. *L. rubricinctus*, sp. nov. Male:—Upperside:—Head, thorax, and abdomen dark brown. Wings dark fuscous except upon the margin of the secondaries, which are adorned by a band of orange red extending from the upper radial to the anal angle. This band is marked at each of the intra-neural spaces by a marginal spot of black, of which that situated between the first and second median nervules is the largest. Underside:—The ground color is pale fawn color, growing paler toward the outer margin, and becoming almost white near the outer margin of the secondaries. Both wings have a short

transverse bar at the end of the cell bordered outwardly by a fine paler line; both wings have an irregular transverse band of similar spots, and a submarginal line followed by a marginal series of triangular spots. The secondaries have two marginal spots of black crowned with red and irrorated with blue-green scales.

Expanse of wings 27 mm. Type in the writer's collection.

6. *L. tisamenns*, sp. nov. Allied to *L. sylvanus*, but less than half the size.

Upperside:—The color of the upperside of the wings is uniformly dark violaceous. Underside:—The ground color of the underside of the wings is a light fawn. Primaries.—Just beyond the cell of the primaries there is a dark transverse band which is interrupted between the median nervules, and defined both externally and internally by lighter lines. This is followed toward the margin by a broader and darker transverse band, which runs from the costa to the first median nervule, and is followed by a narrow brown submarginal line. The fringes are dark brown. Secondaries.—There are two subtriangular spots of dark brown, almost black, upon the middle of the secondaries near the costal margin, a similar spot at the end of the cell, and one upon the inner margin about its middle. These spots are followed upon the limbal area by darker shades, outwardly edged by pale lines. The submarginal line of the primaries is continued upon the secondaries, enlarging at the first median nervule, and just before the anal angle into red marginal spots pupilled with black. The fringes are as on the primaries. The palpi and the abdomen upon the lower side are white.

Expanse of wings 20 mm. Type in the collection of the author.

NACADUBA Moore.

7. *N. stratola*, sp. nov. ♂. Upperside:—Both the primaries and the secondaries are dark shining brown in certain lights reflect-

ing very obscurely a greenish blue gloss. The cilia are lighter. Underside:—The ground color is a slaty gray, much paler than the upper surface. Both wings are adorned by a marginal row of small dark spots, succeeded inwardly by a row of sagittate marks, defined inwardly and outwardly by fine light lines. The marginal spot at the anal angle and the one between the first and second median nervule of the secondaries are deep black crowned with a fine line of bright blue. The discal and basal areas of both wings are adorned with dark spots arranged in bands and all defined on the inner and outer edges with lighter colored lines. The inner margin of the primaries is lighter than the rest of the wing.

♀. The female does not differ materially from the male in color and size.

Expanse of wings 26 mm.

Described from numerous examples in the collection of the author.

LYCAENA Fabr.

8. *L. paludicola*, sp. nov. Upperside:—The prevalent color is dark gray, the posterior wings being ornamented with a very narrow marginal line, within which are located between the extremities of the nervules toward the anal angle six subtriangular black spots margined with pale blue. Underside:—The underside is paler in color than the upperside. Both wings have a double dark line at the end of the cell, defined outwardly and inwardly with light lines. Succeeding this upon both wings are bands of darker markings defined by lighter shades on either side, and succeeded by a submarginal row of lunules defined in the same way. The posterior wings are further ornamented by two subquadrate dark brown spots situated upon the costa, one near the middle, the other near the base; and by a circular spot of the same color upon the inner margin near the base. Of the black spots which are so con-

spicuous upon the margin of the posterior wings upon the upperside, only those just at the anal angle and the two between the median nervules reappear upon the underside. Of these the two at the anal angle are obscure, while those between the median nervules are large and very distinct. They are all crowned with red lines and have their black centres irrorated with shining green scales.

Expanse of wings 28 mm. Type in the collection of the author.

I have assigned this species in a gen-

eral way to *Lycaena* Fabr., feeling unable to refer it to any of the recent subdivisions of the genus instituted by the Indian lepidopterists, without such an examination of the neuration as I do not feel justified in making with only one specimen at my disposal. It is very different in appearance from any other species of the group known to me, and recalls *Pseudodipsas cephenes* Hew., so far as the coloration of the upperside of the secondaries is concerned.

ON AN IMPORTANT CHARACTER, HITHERTO LITTLE NOTICED, IN THE FAMILY BUPRESTIDAE.

BY FREDERICK BLANCHARD.

In Comstock's Introduction to Entomology, part i, the many excellencies of which and its fresh treatment of the subject lead us to hope for the early appearance of the succeeding parts, on page 18, there is given a figure of the underside of *Euchroma gigantea* Linn. in which is shown the antecoxal piece of the metasternum, separated by a short transverse suture, the ends arcuately bent towards and reaching the hind coxae. This appears to be the first distinct reference to this peculiarity of the Buprestidae so far as I can learn. Deyrolle, in his Buprestides de la Malasie, plate 4, figs. 3 and 4 exhibits the same thing, but in fig. 25, illustrating the underside of a species of *Pachyscelis*, the suture is not indicated. There is, however, no reference to the antecoxal piece in the text.

From the examination of a considerable number of genera in this family during the last few years, both native and foreign, it appears that this structure is always present and is of much greater importance in limiting the family than the connate first and second ventrals chiefly depended upon heretofore.

Although the members of the family Buprestidae are usually quite easily recognized, some early errors would have been avoided had this character been observed or appreciated; in our own fauna, notably in the case of the genus *Schizopus* Lec., for the reception of which a distinct family, the Schizopodidae, was created although afterwards suppressed.

It need hardly be said that the existence of an antecoxal piece, seen elsewhere among Coleoptera, so far as I know, only in the Adephaga, where the importance of its existence and of its modifications have been so skilfully demonstrated by Dr. Horn, does not necessarily imply any relationship of the Buprestidae to that series, but adds another, and a most impressive one, to the many known instances of the repetition of characters or structures in widely different families, which have been noticed by writers, and especially by Dr. Horn.

HARRISIMEMNA TRISIGNATA—I found two of these grotesque larvae on *Spiraea tomentosa*, Sept. 22nd, Northborough, Mass. The only food-plant given by Mr. Edwards is "*Syringa*." The larva bored into bits of rotten wood, and "backed out" with the chips. These chips were rolled into neat pellets of almost uniform size, very round,

and evidently kept in shape by some gummy secretion applied by the larva. Each pellet was about one-sixteenth inch in diameter and all could be rolled about without crumbling. When the burrow was finished the larva "backed in" and closed the opening with a thin, transparent, parchment-like door. It took over twenty-four hours to make the burrow and seal it. *C. G. Soule.*

MISCELLANEOUS NOTES.—Mr. C. P. Gillette, formerly entomologist at the Experiment Station at Ames, Iowa, has removed to Colorado to take a similar position at Fort Collins.

A continuation of Mr. J. H. Emerton's New England spiders appears in the last part of the Transactions of the Connecticut Academy. It concerns the Drassidae (33 sp.), Agelenidae (11 sp.), and Dysderidae (2 sp.), with six plates crowded with excellent figures; more than half the species are regarded as new.

Baron Osten Sacken has suggested in the February number of the Entomologists' monthly magazine a new classification of the families of nemocerous Diptera.

A timely and convenient catalogue of the described transformations of North American Coleoptera by W. Beutenmüller will be found in the January number of the journal of the New York microscopical society.

L'ABEILLE, the journal of entomology founded by the late abbé Marseul, and by him carried through twenty-six volumes, is to be continued by the Entomological Society of Paris, to which he bequeathed it. Mr. L. Bedel has been chosen editor, and the twenty-seventh volume is now in press. The journal, as formerly, will be devoted mainly to Old World Coleoptera, and the frequency of its issue will depend upon subscriptions and sales.

PROCEEDINGS OF SOCIETIES.

CAMBRIDGE ENTOMOLOGICAL CLUB.

8 June, 1888.—The 139th meeting was held at 156 Brattle St. Mr. J. H. Emerton was chosen chairman.

Mr. C. W. Woodworth exhibited speci-

mens of a species of *Typhlocyba* found on the rose, to which they are very injurious. He also showed a specimen of a species of *Jassidae* found on the apple. No jassids have before been found on that tree.

Mr. S. H. Scudder remarked on the number of subsegments in the larvae of butterflies. Mr. Scudder has applied this to the position of *Libythea*, which has been variously placed in the Pierinae, Nymphalidae, and Erycininae.

Mr. Scudder stated that most of the changes in the larvae of the Lepidoptera, such as moults, etc., occur before ten o'clock in the morning.

Mr. S. H. Scudder mentioned the finding of the larva of *Oeneis semideia* which had formed a very slight silken cocoon for pupating. It is now a pupa.

9 November, 1888.—The 140th meeting of the Club was held at 156 Brattle St. Mr. J. H. Emerton was chosen chairman.

Mr. J. H. Emerton exhibited some drawings of spiders made by himself and Mr. Edwin Sheppard for Dr. H. C. McCook of Philadelphia.

Mr. S. H. Scudder showed a collection of butterflies brought together to illustrate mimicry in this country. Considerable discussion of the subject of protective mimicry followed.

Prof. C. H. Fernald spoke of the work of the State experiment stations, established under the new act of Congress appropriating a sum of money to each state for the purpose, and especially of the Hatch Experiment Station of the Amherst Agricultural Collège, of which station he is entomologist.

Mr. S. Henshaw read a paper for Miss Caroline G. Soule on a mode of preserving pupae of *Sphingidae* through the winter.

Mr. H. Hinkley spoke of forcing the early emergence of *Sphingidae* by keeping the pupae at room temperature.

Mr. S. H. Scudder described how Mr. S. L. Elliot kept his pupae through the winter, and mentioned the opportunity offered by a cold storage company in Boston for wintering hibernating insects.

Mr. H. Hinkley described a double cocoon of *Attacus promethea*.

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The regular meetings of the Club are now held at 7.45 P.M. on the second Friday of each month, at No. 156 Brattle St. Entomologists temporarily in Boston or Cambridge or passing through either city on that day are invited to be present.

A very few complete sets of the first five volumes of PSYCHE remain to be sold for \$25. Vol. I will not be sold separately.

SAMUEL HENSHAW, Treas.,
Cambridge, Mass.

The following books and pamphlets are for sale by the CAMBRIDGE ENTOMOLOGICAL CLUB:

Burgess, E. Contributions to the anatomy of the milk-weed butterfly, *Danaus archippus*. Boston, 1880, 16 p., 2 plates. . . . 1.00

Casey, Thomas L. Contributions to the descriptive and systematic Coleopterology of North America. Part I-II. . . . 1.00

Grote, A. R. Check list of the Noctuidae of America, north of Mexico. Buffalo, N. Y. 1875. 25

Grote, A. R. Revised Check list of the North American Noctuidae. Part I. *Thyatirinae-Noctuinae*. Bremen, 1890. 50

Hitchcock, Edward. Ichthyology of New England. Boston, 1858 1.50

Packard, A. S. Synopsis of the *Thysanura* of Essex County, Mass. Descriptions of new American *Phalaenidae*. Notes on N.A. moths of the families *Phalaenidae* and *Pyrallidae* in the British Museum. On the cave fauna of Indiana. Salem, 1873. 50

Schwarz, E. A. The Coleoptera of Florida 50

Scudder, S. H. The earliest winged insects of America: a re-examination of the Devonian insects of New Brunswick, in the light of criticisms and of new studies of other paleozoic types. Cambridge, 1885, 8 p., 1 plate 50

Scudder, S. H. Historical sketch of the generic names proposed for Butterflies. Salem, 1875. 1.00

Scudder, S. H. The pine-moth of *Nantucket*, *Retinia frustrana*. col. pl. Boston, 1883. 25

Scudder, S. H. The fossil butterflies of Florissant, Col., Washington, 1889 1.00

Weber, F. *Nomenclator entomologicus*. Chilonii et Hamburgi, 1795, 171 p. 50

SAMUEL HENSHAW, Treas.,
Cambridge, Mass.

PSYCHE.

SOME OLD CORRESPONDENCE BETWEEN HARRIS, SAY, AND PICKERING.—I.

[Many years ago Dr. J. L. LeConte entrusted to me some letters of Dr. T. W. Harris and Dr Charles Pickering, for use if I wished it in the Entomological Correspondence of Dr. Harris, then preparing. Most of them were written in the earliest period of their entomological studies, from Milton and from Salem, and in the discrimination that had then to be made from the great volume of correspondence, only one of them was used, (*loc. cit.*, 251), viz. one from Harris to Say, written from Milton in 1829. The others, however, are so interesting as showing the condition of entomology at a time when the numbers of its devotees in this country could easily be counted on one's fingers, and as revealing in some slight degree the temperament and character of the different writers that I have thought it worth while to reproduce them in *PSYCHE*, one at a time, that others may share the pleasure I have had in their perusal.

The letters proposed to be printed in this series are six from Dr. Harris and two from Dr. Pickering, all addressed to Say, together with the abbreviated draft of Say's replies, which, whenever such occur, were scribbled on the back of the writer's letters. They will be printed in chronological order, first five letters from Dr. Harris written between 1823 and 1825 with Say's replies, then

two from Dr. Pickering, both of 1825, and finally the last of Dr. Harris's, of somewhat later date, in 1834, the last from each of Say's correspondents bearing no reply. All are printed exactly as written, abbreviation, punctuation, and all, with an occasional memorandum of my own in brackets. The first of the series is given below with the reply. The others will follow under the above caption, from time to time as opportunity offers.—*Samuel H. Scudder.*]

[HARRIS TO SAY.]

MILTON, (Mass.) July 7, 1823.
To THOMAS SAY, ESQR.

Sir,

Though personally a stranger to you I have taken the liberty of addressing you—and, in doing so, I have the permission of Mr. Nuttall to use his name as a password to admit me to your notice. An ardent love of Natural Science has induced me, though engaged in an arduous profession, to devote some of my leisure moments to the study of Botany & Entomology; but the want of books, time, & patience, has not permitted me to make any great proficiency. Permit me, Sir, respectfully to request your aid in this pursuit, so far, at least, as to answer some queries which I would propose to you. In May 1822 I accompanied an invalid to Philadelphia, but was hurried away by

the nature of my patient's complaint, before I could obtain the honour of an introduction to you, a circumstance which I have greatly regretted ever since. I however saw Mr. Peale's museum, & found that Mr. Titian Peale was making a collection of insects; among these I observed that which perforates the apple tree, known here as the *apple-tree borer*. This (which I presume to be of the *Cerambyx* family) I was informed had been described by you. Please inform me the name it has received, & where I shall find your account of it. There is another insect very destructive to our Peach trees, boring around the trunk near the root, & which from the chrysalis (for I have not as yet obtained the perfect insect) must be the larva of a *Cossus*, or some other of the wood eating lepidopterous caterpillars. Length of the larva one & a quarter inch (legs 16.) colour white, with a reddish tinge. Do you know it? The Locust tree is infested by a large species of this kind, which is described by Prof. Peck, in the Mass. Agricult. Papers, by the name of *Cossus Robinia*. This, as I have ascertained, also perforates the Black Oak (*Quercus tinctoria* Bart.). The Peach tree is subject to the attacks of a *Buprestis*, which perforates such branches as are old & incline much. The name of the species I do not know. Length rather less than $\frac{1}{2}$ inch. Colour of the elytra dull brassy brown, with 3 or 4 irregular longitudinal lines. Abdomen above green; below brilliant cupreous. I am particularly desirous to obtain information respecting our native

species of *Lytta*, or Meloë. In Boston *Lytta atrata* Fabr. is sold for *Lytta vittata*; & some of our Physicians have confounded *L. cinerea* under the same name *vittata*. This is not important in practice; but is so in nomenclature. Are not all three, together with *Lytta marginata*, of the genus *Cantharis* of De Geer, Geoffr., Oliv., Lamarck, & Latr., as defined by Leach in Brewster's Encyclopædia? What species have you in Pennsylvania? Are any kept by apothecaries for the purpose of vesication? By what names are they sold? On what plants are they principally found? At what times? And are they easily procured? *Lytta atrata* and *cinerea* are very common here: *vittata* and *marginata* I have seen in collections only: none others have I yet found. Do you know the æconomy of these insects? Do the larvæ live and metamorphose in the earth? Any information, or reference to authors on the subject will be gratefully received. Illiger's Magazin 1.256 has been quoted; but I have not the work to consult; if you have access to it, pray give me the substance of his account. It is my intention to draw up a description of these species, for some of our medical journals, in order to correct the mistakes in the names of the species, and your observations, if you will favour me with them, shall be duly acknowledged.

Has the *moth* from the *apple-worm* been described? and by what name? The gregarious caterpillar, which infests some trees in autumn, enclosing whole branches in a web, and devouring all but one membrane of the leaf, giving it

the appearance of having been scorched by fire, is produced by a small white moth (genus *Artica*?) immaculate, and but little more than half an inch in length. What is the species? Can you give me the history of the common *rose-bug*, *Melolontha subspinosus*? Fabr., or of the striped cucumber-bug? *Chrysomela*—?

My collection of insects is small, containing but few more than 500 species, & my professional avocations will not permit me to increase it much. If I have any species which could be acceptable to you, they are at your service. I have fine spec. of Pap. *Troilus*, *Asterias*, *Plexippus*, *Idalia*, &c., *Bombyx Cecropia*, *Polyphemus*, *Prometheus*, with their cocoons, that of the latter being very curious. I have also *Hemerobius cornutus*, *Pectini[c]ornis*, &c; many Hymenoptera, among which *Leucospis dorsigera*, *Ichneumon pennator*, the gall insect of the black oak &c. Also several insects interesting as having been described by the late Prof. Peck. Such as *Stenocorus putator* Peckii, which prunes the branches of the oak; *Rynchanus strobi* Peckii, perforating the leading shoot of the white pine; *Rynchanus cerasi* Peckii, inhabiting the cherry and plum; *Tenthredo cerasi*, the cherry tree slug. I have hitherto pursued the study of Entomology without any other systematic work than Samouelle's little compendium; and, having very recently procured Fabricius, have not ascertained more than one tenth of the species in my collection. How deplorably ignorant I am you will therefore easily imagine—indeed it must

be sufficiently apparent from this letter.

Accompanying this, is a little memoir, which was printed in the Agricultural Journal. The species described I have since found to answer tolerably to *Bombyx acris* Fabr.; the colour of the wings of the male however is not so dark, & the ash-coloured female is not mentioned by Fabricius; & though it may possibly prove to be the same insect, yet I think its identity could hardly have escaped the observation of Prof'r Peck. I confess that I am much more interested in the *history* of such insects as appear to be injurious, or promise to be useful, than in the mere *collection* of such as are curious only.

A correspondence with you would be esteemed a great gratification & honour. I must rest my claim to your notice, principally, on the similarity of our pursuits, on my desire for information, & on your ability to give it. Which if you do, it will greatly oblige, Sir,

Your humble serv't

T. WM. HARRIS.

Please address your reply to Thaddeus William Harris, M. D., Milton, Mass.

[DRAFT OF REPLY BY THOMAS SAY.]

The beginning of my reply was a copy of the answer to —.

I shall endeavour to reply to y'r inquiries as well as time & memory will permit. The apple borer I've desc'd under name *Saperda 2-fasciata* Melsh. The name however is a very bad one, inasmuch as the ins. is not banded, but ornamented w. 2 wh't long'l broad lines; notwith'g this as the name has b'n given

and to my knowledge, I cannot stoop to the knavery of changing it.* The publ'n of the paper will soon take place in the Journal, it was in fact in the press before I ret'd from N. W. [the North-west]. The fact of the Peach tree being subject to the attacks of a Buprestis is altogether new to me. We have 2 sp. at least wh. agree w. y'r desc'n viz. *femorata* & *characteristica*. The latter being rather larger than y'r mensuration & the thorax having elevated lines as well as the elytra I think it probable y'r depred'r is *femorata* wh. is orn'd w. 2 dull brassy irregular spots on ea. elytron more or less indistinct, but somet. obsolete.

The g's *Lytta* F. is certainly same w. *Cantharis* Oliv. &c. The larvæ of the Cantharids live & metam'e in the earth feeding on roots &c, but for more inform'n I must refer you to Sonnini's *Bufon* Vol. 54, p. 395; also Olivier, Vol. 3. The no. of sp. already disc'd in the U. S. is 16, viz. *segmenta* †, *vittata* ×, *marginata* ×, *atrata* ×, *Nuttalli*†, *aloida*†, *articularis*†, *immaculata*†, *aenea* ×, *polita*, *sphaericollis*†, *maculata*†, *ferugina*†, *cinerea* ×, *Afzeliana*, *reticulata*†; of these those marked w. a × inhabit this state, those marked w. a † have been desc'd by myself and will appear in the Journal. It is prob'e that nearly if not all of these sp. might be used w. effect

in vessication. By far the finest sp. is the *Nuttalli*, wh., as well as 2 or 3 of the other sp. is somew't larger than *vesicatoria* & more brilliant. On one occasion near Rocky M's. I saw this sp. in such nos. that I c'd have gathered a couple of quarts in $\frac{1}{2}$ an hour, but few were seen elsewhere, & but one occurred on last exped'n. Have not Illiger, nor moth of apple worm. Do not know wh. species of greg's caterp's you mean. Rose-bug is *Mel. subspinosa* F. and cucumber bug is *Crioceris vittata* F., but I know no more of their history than is familiar to every farmer. It w'd give me g't pleasure to see those ins. you mention desc'd by Peck. I have not met w. his desc'n.

The Peach Insect I desc'd sev'l months since for a paper by Mr. Worth on this ins. under name of *Æ. exitiosa*. W'n this essay will be publ'd I do not know, it was read to the A. N. S. 6 or 8 months ago. The sexes are very diff't. I have b'n desc'g shells of U. S. & w'd be much obliged to you for any sp's you may pick up on y'r coast. Land and fresh water shells also highly accept'e. I will be happy to send you the names should you wish it. Your salt marsh caterpillar is cert'y the *B. acria* F. and it is fig'd by Drury and also by Cramer under the name of *B. caprotina*.

PERSONAL NOTES. — Mr. P. R. Uhler, one of the leading American entomologists, has recently been elected provost of the Peabody institute in Baltimore. Mr. Uhler will still retain the position of librarian which he has held for the past twenty-five years. It is not

*[He changed his mind, describing it in this very paper under the name of *bivittata*. It is the *S. candida* of Fabricius.]

a little curious how many entomologists have held the position of librarian in the public institutions of this country.

We deeply regret to announce the death, on February 25, of Mr. Holmes Hinkley of Cambridge, one of the active members of the Club and an ardent student of our Lepidoptera.

OEBALUS PUGNAX AN ENEMY OF GRASSES.

BY H. GARMAN, LEXINGTON, KY.

THIS is one of the commonest of the Pentatomidae in Kentucky, occurring everywhere in July and August on grasses. Its constant presence and abundance on millet attracted my attention in 1889, but with *Podisus spinosus* and other predaceous members of the family in mind, it was assumed to be there after other insects, and was not given special attention. In the summer of 1890 it was again found to be common on several species of *Setaria* and *Panicum*,—so common that as many as twenty adult bugs could be taken from a single stool of grass. This time the incongruity of a predaceous insect congregating on particular species of grasses, where there was no evident animal food, made its impression, and a brief examination was sufficient to show that the bugs were attracted by the grasses themselves, which they were puncturing, and from which they were extracting the sap. They seemed especially fond of the young spikelets, and where the bugs were abundant large numbers of the spikelets were found to be dried up, having been emptied of their contents.

On July 16 a number of the bugs were collected from *Setaria glauca* and *Panicum sanguinale*, and confined with a bunch of grass in a breeding cage, where they were observed to continue

their work of puncturing the spikelets.

Some individuals were coupled when taken, and on the 19th of July the eggs were found to have been placed in scattered clusters of about a dozen eggs each, on the stems of grass, and on the sides of the cage. Each cluster consisted of two series, the eggs being in contact, but those of one series alternating in position with those of the other. This arrangement of the eggs accommodates them to the stems of grasses. The habit of so arranging them appears to be fixed, for no matter where placed the double lines were always adhered to. The eggs are pale green, and measure .7 mm. in length by .6 mm. across, the diameter being maintained to the extremities. The attached end is perceptibly convex. The free end is so little convex as to appear flat; it is rimmed, and provided with a marginal series of capitate appendages which are so small as not to be easily made out even with a good lens.

From my own observations I should have supposed *Oe. pugnax* to be exclusively a vegetable feeder, but in the fourth report of the United States Entomological Commission, p. 97, I find it stated that the species has been observed attacking the cotton worm. Of course there is nothing improbable in its taking both vegetable and animal food.

A LIST OF THE ORTHOPTERA OF ILLINOIS.—III.*

BY JEROME MCNEILL, FAYETTEVILLE, ARK.

ACRIDIDAE (OEDIPODINI, TRUXALINI.)

46. *Arphia sulphurea* Fab. This is a common species throughout the state. In the northern part of the state there is but one brood a year and the individuals pass the winter as larvae or pupae, being found in exactly the same localities as *Chortophaga viridifasciata* De Geer and *Hippiscus tuberculatus* Pal. de Beauv. They become full fledged as early as the 14th of May and disappear about the first of July.

*47. *Arphia xanthoptera* Burm. This species is said by Thomas to inhabit Illinois, but I have seen no specimens that could be referred with certainty to this species unless indeed *A. carinata* Scudd. is a synonym. I have been inclined to this opinion but Sausure still continues to separate them and it is probable that he has been able to compare *carinata* Scudd. with Barmeister's type.

48. *Arphia carinata* Scudd. This is a very common species throughout the state, formerly thought to be a variety of *sulphurea* Fab., but it seems to be quite distinct and the two species are now placed in different divisions of the genus. In practice they may be distinguished by the facial costa which

is acuminate towards the vertex in *sulphurea*, while in *carinata* Scudd. the sides of the facial costa are nearly parallel from the median ocellus to the vertex. The carina of the pronotum of the latter is very high and strongly arched while in the former it is but little elevated and nearly straight. The earliest appearance of this species in northern Illinois is the 20th of August.

49. *Arphia tenebrosa* Scudd. Mr. Thomas says this species is occasionally seen in the extreme northwestern part of the state.

50. *Chortophaga viridifasciata* De Geer. Common throughout the state, though never very abundant. The larvae and pupae winter in the same situations with *Arphia sulphurea* and complete their transformations only a few days sooner than the last mentioned species. This species is the first of the order to reach maturity in the spring and the note of the male is the beginning of the grasshopper chorus which continues for six months or more. It is a very variable species, but all of the varieties may be referred to two forms, the green and the brown, which is a seasonal form apparently and therefore worthy of a name according to the rules of systematic zoölogy. It should therefore be called *Chortophaga viridifasciata infuscata* Harris. This form as has frequently been remarked is the com-

* In the first two parts of this paper, in almost every case where I have accredited specimens to the Museum of the University of Illinois, I should have said the Museum of the Illinois State Laboratory of Natural History.

mon one in the early spring and while green males are very rare at this season green females are common; later the green form predominates and the brown form is the one of exceptional occurrence, but the males are less uncommon than the females. In the northern part of the state there is but one brood that hatched from eggs in the late summer and matured the following spring, so that the form *infuscata* is the common one always. In Moline I have captured full grown specimens as early as the twenty-second of April and as late as the seventh of July.

51. *Encoptolophus sordidus* Burmeister. Common throughout the State but more abundant northward. While the males of many species and the females of some species occasionally fly with a crackling noise, the males of this species seem not to be able to fly at all without making this noise. This is a fortunate circumstance for the collector since the dark color and the short and exceedingly quick flight of the male make it very difficult to follow. I captured specimens from August twenty-first to the thirtieth of October.

*52. *Cammula pellucida* Scudd. This species undoubtedly occurs in the northern part of the state although I have never seen a specimen taken within its borders. I have specimens from Wisconsin and Mr. Thomas includes the species in his List of the Orthoptera of Illinois on the authority of Mr. Scudder.

53. *Hippiscus tuberculatus* Pal. de Beauv. This a rather common species

in the early spring. Larvae and pupae pass the winter under the shelter of leaves and grass and mature very early in the spring, about the first of May. It shows a decided preference for certain localities, being found year after year in the same field or on the same hillside. From these favorite haunts it never seems to wander far although apparently well able to fly across the state. There are two places each a few rods square on Rock Island where I have never failed to find them summer or winter and these are the only places where they are to be found on the Island, which is three-fourths of a mile wide and three miles long.

54. *Hippiscus rugosus* Scudd. This species is also rather common at Moline and probably throughout the state. The red and the yellow winged forms are found in about equal numbers in Rock Island Co. except on the "Sand Hill" where they are quite common and all apparently yellow-winged. I have taken them on Rock Island as early as the 20th of August. A specimen in the Illinois state laboratory of natural history bears the date of Aug. 14, taken at Pekin.

55. *Hippiscus phoenicopterus* Burm. This is the species formerly known as *H. discoidens* Serv. while the species that used to bear the name *phoenicopterus* is now known to be *H. tuberculatus* Pal. de Beauv. I have taken a single species at Moline. It is probably a rare species throughout the state. Taken the 5th of September.

*56. *Xanthippus neglectus* Thos. Thomas says he captured it in the

southern part of the state but thinks it is rarely found there. I do not know of its occurrence elsewhere.

57. *Dissosteira carolina* Linn. Abundant everywhere along roadsides and railroads especially. Taken as early as the 25th of June.

*58. *Spharagemon aequale* Say. It is not certain that this species occurs in the state although Thomas says it is found "throughout the greater part of the state." It is in no collections that I have seen while the species next named is abundant wherever I have collected in Illinois or Iowa or Indiana; but as its occurrence here is not improbable I have not excluded it from the list.

59. *Spharagemon bolli* Scudd. Common on dry hillsides. It makes its appearance as early as the 21st of June. This is the only species with which I am acquainted, except *Dissosteira carolina* Linn., that remains stationary a few feet above the ground and in some manner produces a dry rustling note. I have known this species to go through the performance in but one instance although it was repeated several times by different individuals. As four out of the five individuals that I captured on the spot were males, the thought suggested itself that it might be a part of the courtship of the species.

60. *Spharagemon collare* Scudd. This species occurs rarely on the tops of high sandy hills, in Rock Island Co. and doubtless throughout the state as I have found it as far south as Pine Bluff, Ark., where individuals were found abundant along the sandy shore of the

Arkansas River. They are abundant however on the "Sand Hill." They have been taken at Moline as early as the 28th of August.

61. *Psinidia fenestralis* Serv. This has been found, so far as I know, in but a single locality in the state, the sand hill at Moline Bridge. It is abundant here on the bare sand. Its crimson wings make it conspicuous but when on the ground it is so small and colored so nearly like the sand that it is not easy to see it and its flights are so short and quick that it is not very easy to capture. Aug. 28th is the earliest recorded date of its capture.

*62. *Mestobregma cincta* Thos. Said by Thomas to occur sparingly in southern Illinois.

63. (?) *Philobostroma parva* Scudd. I think I am not mistaken in referring to this species a considerable number of individuals found on the sand hill, Sept. 2, and at Cordova Sept. 28. They are very variable in size and color but as the lateral foveolae are always very distinct they are easily distinguished from *Philobostroma quadrimaculata* Thos.

*64. *Trimerotropis maritima* Harr. Said by Thomas to occur in the northern part of the state.

65. *Circolettix verruculatus* Kirby. The collection of the State laboratory of natural history contains two specimens, one from Henry, Ill., and the other from Birds Point, Mo.

66. *Chloëaltis viridis* Scudder. Seems to be common throughout the state, but it is never abundant. Specimens of both the brown and green varie-

ties will be found in any locality, but so far as my experience goes the green specimens far outnumber the brown everywhere and at all seasons. It is a grass loving species as indeed are the group Truxalini generally, being in this respect strongly contrasted with the Oedipodini, which very generally prefer barren hillsides or other localities characterized by somewhat scanty vegetation. The short wings as in allied species are quite variable. I have one in my cabinet with elytra and wings quite as long as the abdomen. Specimens have been taken at Moline as early as the ninth of July, and as late as the fifteenth of October.

67. *Chloealtis conspersa* Scudder. Probably found throughout the state, though never abundant and perhaps not everywhere common. The females are very likely to be confused with the brown females of the preceding species from which they may always easily be separated by the slight median carina of the vertex. The wings and elytra as in the preceding species are quite variable, one specimen in my collection having elytra which extend one fourth their length beyond the tip of the abdomen. The species is noted for the exhibition of a habit not possessed by any other member of the family so far as is now known. This peculiarity is its habit of depositing its eggs in holes bored in slightly decayed wood. This fact was first reported by Mr. S. I. Smith in his List of the Orthoptera of Maine. It has since been corroborated by the observations of Mr. C. A. Hart of Champaign.* This species makes its

appearance in spring even earlier than *C. viridis*; indeed I know of but one other, *Pezotettix viridulus* Walsh, that is developed earlier from eggs hatched in the spring. It has been found in Moline as early as the twenty-first of June and as late as the twenty-fourth of September.

68. *Stenobothrus curtipennis* Harris. Quite common throughout the state and generally more abundant than either of the two preceding species. It has a decided preference for thick blue grass growing in partially shaded situations. Like its allies it can scarcely be said to either fly or jump, but it suffers little or nothing in lacking these accomplishments as its astonishing facility as a tumbler and contortionist generally discourages all but the most determined efforts for its capture. It appears almost as early in the spring as the preceding species, its first recorded appearance at Moline being the twenty-third of June, and its latest appearance the twenty-fourth of September.

69. *Stenobothrus maculipennis* Scudd. This very variable species is common in a few localities. It occurs on the "Sand Hill" several times referred to and described in this paper. It is found too on the barren or sandy tops of the highest hills along the bluffs of the Mississippi and Rock Rivers. It is full-fledged about the first of August.

70. *Syrbula admirabilis* Uhler. Widely distributed but rare or uncommon. Thomas described the brown form of the male and did not know of the existence of the green form. I have raised from pupae several males which

*See also Scudder. Rep. Geol. N. Hampshire v. 1, 371-372.

show the usual green color and markings of the females. The earliest appearance at Moline is August 22.

*71. *Mermiria bivittata* Serville. Very rare if it occurs at all in the state. Mr. Thomas thinks he has seen one specimen taken within this limit. It has been taken at Omaha, Nebraska, by Mr. Lawrence Bruner so that its occurrence here is very probable.

72. *Truxalis brevicornis* Linn. This is a southern species but it extends as far north as Urbana, Illinois, where I am told by Mr. C. A. Hart it has been frequently taken at the electric light, as many as seven or eight having been taken in one evening, August sixteenth

LESTES EURINUS SAY.—This species appears never to have been taken since Harris's day, who obtained his specimens on the borders of ponds in Milton, Mass., in 1826. The only notices which have been published since the description by Say, in 1839, have been based solely on his text. The accompanying description is from the type (a ♂) in the Harris collection of the Boston Society of Natural History. It is a true Lestes.

Greenish blue above, yellowish beneath. Head bronze blue above, yellow beneath; apex of clypeus, labrum, sides of mandibles, and front of face very pale greenish blue, glistening. Thorax bright blue above with violaceous reflections and with dorsal and lateral sutures yellowish brown; sides of thorax blue, the side of mesothorax with a biserrate lemon yellow spot occupying lower posterior third, that of metathorax yellow with an oblique triangular fuscous stripe; base of all the legs, and under surface of femora (especially of posterior pair) yellow; upper surface of femora, lower surface of tibiae and tarsi brownish green; upper surface of tibiae fuscous; wings subhyaline or very slightly flavescent, pterostigma black;

1888. The frequent occurrence of a rare species at the electric light is more remarkable since it is of very rare occurrence for the commonest species of Acrididae to visit a light.

73. *Arcyptera lineata* Scudder. A very rare form in the northern part of the state. I have taken a few specimens on the Iowa side of the Mississippi opposite Watertown. This is pretty certainly the species from the northern part of the state, which Thomas says he saw for too short a time to certainly identify. In his list it is given as *Stetheophyma (Arcyptera) gracilis*? Scudd. The single specimen in my collection was captured August 9.

abdominal segments 1-5 above blue, 6-10 blackish green; beneath very pale fuscous, more dusky posteriorly, their apices blackish; superior appendages forcipated, beneath bidentate interiorly; the first tooth at the extremity of the basal fourth sharply pointed, directed posteriorly; the second, just beyond the middle, depressed, laminate, denticulate, directed toward that of the opposite appendage (inferior appendages lost); thirteen postcubital cross nervules on right, fifteen on left fore wing.

Length (inc. forceps) 46 mm.; alar expanse, 59 mm.; length of pterostigma, 2.5 mm.

SAMUEL H. SCUDDER.

HEMIDIPTERA HAECKELII.—Entomologists who would derive the Diptera from the Hemiptera, if any such exist, will be delighted to find in the last number of the *Jenaische zeitschrift für naturwissenschaft* (bd. 25, heft. 1 & 2, 1890, p. 13-15) a description of what purports to be a "zwischenform", connecting these two widely separated orders. Dr. N. Léon figures and gives a brief description of an insect taken by Prof. Ernst Haeckel in Ceylon together with species of

Halobates. The insect, of which Dr. Léon had only a single specimen, is 4 mm. long. Its mouth "is constructed exactly like that of the Hemiptera," it has typical hemipteran antennae, a pair of prominent compound eyes, three stemmata, and the head is not freely attached to the thorax. The wings, of which only the mesothoracic pair is present, appear to be hyaline, with a venation which by no stretch of the imagination can be regarded as dipteran. The legs are hairy and adapted to swimming; there are three tarsal joints, the last of which terminates in a single claw. When we come to look for dipteran characters the only one that can be found is the lack of metathoracic wings; as if this character were sufficient to elevate a hemipter to the rank of a dipter! Has Dr. Léon ever heard of the two-winged male Coccidae, which no tyro in entomology would think of placing among the Diptera? The stemmata furnish Dr. Léon with another reason for regarding his insect as allied to the Diptera, because, forsooth, the *Hydrocorisa* have no stemmata! We are informed that at the very beginning of his examination of this insect, Dr. Léon saw that he was not dealing with a *Halobates* but with a form which resembles a dipter more than a hemipter. He further states that Dr. Arnold Lang, to whom he communicated his observations was of the same opinion. We cannot believe that so eminent a phylogenist as Dr. Lang could have examined the specimen. The insect is not a hemipter but a genuine hemipter albeit with only one pair of wings. It will hardly be necessary to study its ontogeny for the sake of ascertaining that it does not hatch as a maggot and does not pass through a quiescent pupa stage. W. M. WHEELER.

PROTECTION BY CONSPICUOUS COLORS.—The following passages in Lord Walsingham's last presidential address to the Entomological society of London are suggestive:—

"My attention was lately drawn to a passage in Herbert Spencer's 'Essay on the

Morals of Trade.' He writes:—'As when tasting different foods or wines the palate is disabled by something strongly flavoured from appreciating the more delicate flavour of another thing afterwards taken, so with the other organs of sense, a temporary disability follows an excessive stimulation. This holds not only with the eyes in judging of colours, but also with the fingers in judging of textures.' "

"Here, I think, we have an explanation of the principle on which protection is undoubtedly afforded to certain insects by the possession of bright colouring on such parts of their wings or bodies as can be instantly covered and concealed at will. It is an undoubted fact, and one which must have been observed by nearly all collectors of insects abroad, and perhaps also in our own country, that it is more easy to follow with the eye the rapid movements of a more conspicuous insect soberly and uniformly coloured than those of an insect capable of changing in an instant the appearance it presents. The eye, having once fixed itself upon an object of a certain form and colour, conveys to the mind a corresponding impression, and if that impression is suddenly found to be unreliable the instruction which the mind conveys to the eye becomes also unreliable, and the rapidity with which the impression and consequent instruction can be changed will not always compete successfully with the rapid transformation effected by the insect in its efforts to escape. . . .

"If this protective effect of the partial and intermittent display of brilliant colouring is so obvious in relation to the human eye, must it not be at least equally so in relation to the eyes of its more natural enemies, such as birds, and have we not here indicated a new and distinct line of investigation as regards the use and advantage of brilliant colours in many cases which cannot be accounted for by the theory that they are developed for the purpose of warning, or through their aesthetic relation to courtship?"

GREEN BUTTERFLIES.—“Grant Allen shows that, while greenish flowers are among the oldest, really green flowers are the most recently developed of all and among the most conspicuous. Very much the same thing is true of Lepidoptera. Pale green moths, like *Actias*, *Geometra*, and *Pachyarches*, are protected by their colouring, which is common to both sexes, and are quite hidden when nestling among the leaves. Such seems also to be the case with *Lehera eryx*, a lycaenid which is greenish on the underside, and may possibly be the case with some *Catopsilia*s. But bright metallic-green is, I think, the latest developed colour among butterflies, and decidedly the most conspicuous. No one who has not seen it can imagine the brilliancy of *Arhopala farquharii* or *Ornithoptera brookeana* in the greenest jungle. The brightest of the metallic-blue butterflies look dim beside them. It may be confidently asserted of all such butterflies that, unless the species is protected, only the male is green. The protected *Ornithoptera*s have sometimes assumed green colours as well as golden and orange, and the female shares in this useful ornamentation to some extent. In non-protected butterflies the green is confined to the upperside and is quite invisible except during flight. In the *Lycaenidae* it is found in many *Zephyri*, in some *Poritias* and *Massagas*, in a few *Arhopalas*, and in *Lampides marakata*, a rare butterfly I discovered in the Malay Peninsula and named after its emerald tint above. Among all these, whenever the female is known, it is blue, orange, black, violet, or any other colour but green. The conservative and, in butterflies, unadorned sex, has not yet acquired the latest development in colours. It is also remarkable that the green colours seem to occur where the genus is most dominant. The Malay Peninsula and Borneo form the great centre of development of the genera *Arhopala* and *Lampides*, and it is there that most of the green species occur. The outlying *Arhopalas*, those of the North-West Himalayas, and the Timorian islands, are all blue. In *Zephyrus*, the green

species are found only where the genus is best represented and most vigorous. *Zephyrus pavo*, a species found in the Bhutan and Assam hill-ranges, remote from the regular habitat of the genus, has, I discovered, the male blue and greatly resembling allied females from the Western Himalayas. The green and orange *Ornithoptera*s also occur only in the heart of the *Ornithoptera* region. These remarks on green butterflies also apply in some degree to certain other unusual colours of great brilliancy, such as the shining coppery gold of *Ilerda brahma*, and the fiery red of *Thamala marcianna*. It ought to be borne in mind that such colours must never be ascribed to a female without careful examination.” *W. Doherty* (Journ. Asiatic soc. Bengal, v. 58, pp. 416-417).

THE HABITS OF BRACHYTRYPUS, the huge desert cricket of the Mediterranean region, have only recently been studied by A. Forel, although, excepting the mole crickets, it is the largest known European form. The reason appears in the fact that it is a nocturnal insect, remaining in its burrows by day and even closing the entrance to the same (although it is three or four centimetres in diameter) to an extent of several centimetres, leaving only a little sand heap to mark its place. Dr. Forel discovered them by marking the spot where he saw and heard them chirping lustily in the dusk, and the next morning detected the heaps, carefully removing which the burrows were found. These extended for over a metre in length and half as much in depth, and digging the creature out was a thankless task; Dr. Forel obtained some by drowning them out and others in a way characteristic of a myrmecologist: he secured a bag of ants, a species of *Acantholepis*, and setting them loose before the burrow, they entered it and soon ousted the occupant.

ALPINE FAUNAS.—An interesting general statement of the characteristic features of the entomological, and especially coleopterolog-

ical, fauna of the canton of Valais, comprising the upper valley of the Rhone will be found in Prof. Ed. Bugnion's Introduction to Favre's *Faune des coléoptères du Valais*, now publishing in quarto form in the memoirs of the Swiss society of natural sciences (vol. 31). Mr. Bugnion divides the district into three regions or zones, the lower, the sub-alpine or forest, and the alpine, their highest levels respectively at 800, 2,000, and 2,700 metres; the subalpine he further subdivides into a lower forest, whose upper limit reaches 1,350 metres, and an upper forest region, the latter characterized by the prevalence of conifers and rhododendrons. These divisions, as he points out in a note, differ from those of preceding authors, though not very greatly from the latest authority. Heer in 1837, writing for the whole of Switzerland, made out seven zones, each 450 metres in height after the field (campestre) which terminated at 300 metres; the succeeding were the hill or colline with an upper limit at 750, the mountain (1,200), subalpine (1,650), alpine (2,100), subnivale (2,550), and nivale (3,000). Rion in 1852 made four divisions as follows:—

1. Zone of cultivation, 375–1,263 m.
2. " " conifers, 1,263–2,050 m.
3. " " alpine pasturage, 2,050–2,760 m.
4. " " eternal snow, 2,769 m. upward.

Christ in 1883 also made four divisions:—

1. Lower zone up to 550 m. (700 in south Switzerland).
2. Zone of deciduous trees, 550 (or 700)–1,350 metres.
3. Zone of conifers, 1,350–2,100 m. (2,300 in central Alps).
4. Alpine zone, 2,100 (or 2,300)–3,000 m. (perpetual snow).

Professor Bugnion gives a large number of groups of specific forms, mostly Coleoptera, inhabiting two districts, or living under different conditions, etc., in illustration of their geographical distribution, and after discussing at some length the geological antiquity of insects endeavors to show from what sources the different elements of the entomo-

logical fauna of Valais were directly derived.

THE ABBÉ PROVANCHER has completed the third volume of the *Faune entomologique du Canada* which has been appearing from time to time as a supplement to his journal, *Le naturaliste Canadien*. It is entirely devoted to the Hemiptera, and makes a volume of 354 pages and five plates. A large number of new species are described, principally from the Province of Quebec; systematic tables of the groups lead to an easy determination of the species. It can be obtained of the author at Cap Rouge.

The volume on the Hemiptera was to be followed by a serial work on the Canadian Lepidoptera in the same journal by the abbé Provancher; but the editor has been obliged to forego his intentions as his journal is no longer to receive a subvention from the Quebec government without which its publication is impossible, and it will accordingly cease with the end of the present volume in June.

PROCEEDINGS OF SOCIETIES.

CAMBRIDGE ENTOMOLOGICAL CLUB.

14 December, 1888.—The 141st meeting of the Club was held at 156 Brattle St. Dr. G. Dimmock was chosen chairman.

Mr. Andrew G. Weeks was elected to active membership.

Dr. H. A. Hagen remarked on swellings along the midrib of the leaves of the young shoots of white oaks found by him which contained hymenopterous larvae.

Mr. S. H. Scudder showed caterpillars collected this year, among them the adult and immature larvae of *Terias lisa*.

Mr. Scudder, in reply to a question in regard to *Anthocaris genutia*, said that it was only found in New England along a line of trap-rock in the Connecticut valley.

Mr. Scudder then showed plates of eggs, larvae, and pupae of butterflies, from his work on New England Butterflies now in press, and remarked somewhat at length on certain species.

Mr. H. Hinkley showed specimens of *Lagoa crispata* which he had raised. It is interesting in that in hatching, it pushes the pupa skin from the chrysalis. The legs, antennae, etc., have separate coverings. There is also a sort of double lid to the cocoon.

11 January, 1889. The 142d meeting of the Club was held at 156 Brattle St. Mr. S. H. Scudder was chosen chairman.

The annual reports of the secretary and librarian were read and accepted. The annual report of the treasurer was read and accepted subject to the approval of the auditors.

The club then proceeded to ballot for officers for the ensuing year. The following were chosen: President: S. H. Scudder. Secretary: R. Hayward. Treasurer: S. Henshaw. Librarian: G. Dimmock. Members at large of Executive Committee: G. Dimmock, and H. Hinkley. Editors of *Psyche*: G. Dimmock and S. Henshaw.

The annual address of the retiring president, Prof. Wm. Trelease, was on Myrmecophilism (See *Psyche* v. 5, p. 171-180).

Remarks were made by Mr. Albert E. Smith on a leaf-cutting ant which is very injurious to the coffee plant in South America. These ants cut off the leaves and carry them away; they are supposed to use them to cover up their subterranean passages.

Mr. S. H. Scudder showed some of the late Dr. Asa Fitch's manuscripts and read a note of his in which he recorded as early as 1855 the occurrence of *Feniseca tarquinius* with plant lice.

Mr. Scudder next called the attention of the Club to the remarkable mode of suspension in the chrysalis of the genus *Thais*, exhibiting specimens of the chrysalis of *T. rumina*. In all the three species of this genus found in Europe the anterior extremity of the chrysalis is furnished with a double tubercle, bristling with short curving hooks, and the chrysalis, besides being attached in the normal way of the Papilionidae by the hinder extremity and the girth around the middle, has also an additional support by the entanglement of these anterior hooks in a loop of silk spun by

the caterpillar in preparing for pupation, and which seems to spring from about the same points as the transverse loop of the thorax. There seems to be very little reference to this peculiar mode of transformation by those who have treated of this genus, although it was distinctly mentioned by Rambur as long ago as 1840 in his *Faune entomologique d'Andalusie*; Boisduval, Rambur, and Grasilin in their work on European caterpillars describe and figure two species and Duponchel gives an independent description and figure of one of them,—all without reference to this peculiar mode of suspension, or to the unique structure of the anterior extremity, to which there seems to be no parallel in the Lepidoptera. Rambur in the work referred to says (p. 243): "The anterior extremity which is pointed and bifid is also furnished with little short hooks which hook themselves in two bundles of thick silk; it is thus supported by the two extremities besides the slight band of silk which embraces it." Yet Doubleday in 1846 says that "according to Dr. Rambur, when about to undergo their metamorphosis, they not only fasten themselves by a transverse thread like the *Parnassii*, but also surround themselves by a very slight silken web," which Rambur nowhere asserts and which is an entire mistake.

He then showed some living pupae of *Pieris napae* and called attention to the differences between them and those of *P. oleracea*. The frontal spine is straight in *P. napae*, short and hooked upward in *P. oleracea*. The pupae of *P. napae* are also more heavily marked. The larvae differ in the amount of pile and in the prominence of the larger wartlets. He stated that the specimens of *P. oleracea* from the temperate regions of America and of *P. napae* from those of Europe are easily distinguishable in their earlier stages and also by the abdominal appendages of the male imago.

Mr. A. E. Smith showed a part of his collection of Orthoptera from Brazil, and remarked at some length on his collecting in South America.

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PSYCHE.

A LIST OF THE ORTHOPTERA OF ILLINOIS.—IV.

BY JEROME MCNEILL, FAYETTEVILLE, ARK.

ACRIDIDAE (ACRIDINI, TETTIGINAE).

74. *Schistocerca americana* Drury. Of rare occurrence north of the center of the state but common southward. I have taken a few specimens in Rock Island County, the earliest recorded appearance being Sept. 20th.

75. *Acridium alutaceum* Harr. The only species of this genus found in Rock Island County. It is found sparingly along rail-roads and in waste ground, but there is a very small district where it is extremely abundant. This is a little strip of ground a few hundred feet in length along the C. B. & Q. R. R. about one mile and a half southwest of Colona, Henry Co. Prof. Garman with a party from Illinois University first stumbled upon this locality a few years ago, and I visited it in 1889. This colony has established itself in a patch of Johnson grass, a species of *Andropogon*, which seems to have furnished it with the conditions exactly fitted for its development. These specimens have the dorsal stripe almost always distinct. Colona, Aug. 12th.

*76. *Acridium emarginatum* Scudd. Reported by Mr. Thomas as having been taken a few times in the state.

*77. *Acridium rubiginosum* Scudd. Said by Mr. Thomas to be a rather

rare species found only in the neighborhood of oak groves.

*78. *Melanoplus spretus* Thomas. Stray specimens have been identified by Mr. Thomas, but it cannot be considered a resident species, as Illinois is outside of even the "Temporary region" as determined by the U. S. entomological commission.

79. *Melanoplus atlantis* Riley. This wide spread species occurs throughout the state. It seems however to be very unequally distributed. In some localities it is about as common as *M. femur-rubrum* while in others it may be very rare. In Rock Island County it is usually rare or at least uncommon but on a sand hill an eighth of a mile south of Moline bridge on Rock River it is very abundant. As this sand hill shelters a number of species which occur not at all or rarely elsewhere in the neighborhood it may be well to say a few words as to its character. It consists entirely of fine clean sand which is in places covered with a thin soil which supports a scanty vegetation of willows and sand-burr but which is for the most part wholly barren. This hill rises gradually on every side from the Rock River bottom. It is about a half mile in length and only a few hundred yards in width at the widest. At the highest

point it is not much lower than the hills on either side of the river valley. Its size and isolated position make it a conspicuous object from the river bluffs for several miles above and below the bridge. It is in fact a small island or "tow head" in the old Mississippi channel. This river as is well known once flowed through the Meridosia swamps, which are situated about four miles above Cordova, into the Rock River valley, which it occupied to the present mouth of this river. A considerable part of this hill is fenced out from stock and here the natural features have been preserved for a long time so that many species retain a foothold or even flourish here which do not seem to occur elsewhere in the county. *Atlanis* seems to be at least imperfectly two brooded in the northern part of the state as I have taken a few specimens as early as the middle of June while the great majority attain the adult stage after the middle of August. It was formerly thought to be not easy to separate this species from *M. femur-rubrum*, the common Red-legged Locust of our meadows, and indeed this difficulty still exists in the case of the females, but it is now known that the males at least can be very readily distinguished from those of the allied species. This distinction consists mainly in the scoop-shaped ultimate abdominal segment, which is obscurely notched at the tip in *atlanis* and in the rounded ultimate segment of *femur-rubrum* which is squarely truncate at the apex.

80. *Melanoplus femur rubrum* De

Geer. This well known species is abundant everywhere in meadows and along wood sides. It has been taken at Moline as early as the twenty-third of June.

81. *Melanoplus collinus* Scudder. This rather common species is pretty closely restricted to the tops of hills and the sides of ravines which are almost too barren for pasturage. It is never, so far as I am aware found in rich bottom lands.

82. *Melanoplus punctulatus* Uhler. The museum of the State laboratory of natural history of Illinois contains two specimens a male and a female from Galesburg and Urbana. These are the only specimens from the state that I have seen.

83. *Melanoplus minor* Scudd. This species is included in the list because its occurrence in Indiana renders its occurrence here almost certain. It has been captured at Bloomington, Indiana.

84. *Melanoplus differentialis* Thos. This species is common along roadsides. Its earliest appearance at Moline is August 8th.

85. *Melanoplus bivittatus* Say. This is an uncommon species in the northern part of the state at least. In eastern Indiana it is not unfrequently so numerous as to do considerable injury to hay and grain crops. It matures at least a month earlier than the last mentioned species, according to my observation, as I have taken it at Dublin, Ind. as early as June 28th and at Moline as early as the 7th of July.

86. *Melanoplus cenchri* n. sp.

Male: Length to tip of abdomen .80 to .90 in.; length of elytra .70 to .74 in.

General color dull brown varying through testaceous to bright yellow, but in the lightest specimens the sternum is dull olive or brown. In the most common form the head, disk and sides of the pronotum are light brown or testaceous or at least lighter in color than the middle region of the body. The black band of the pronotum, common in species of this genus, is entirely obsolete or rarely represented by a faint dusky line or narrow band extending along the sides of the head and the lateral carinae of the pronotum to the base of the elytra. The elytra are testaceous, unspotted or sometimes very obscurely spotted with faint small or medium dusky flecks. The posterior femora have the upper half of both the inner and the outer faces infuscated or at least darker than the lower part with upper margin marked with three lighter spots. The posterior tibiae are bright blue with white spines tipped with black. The whole body is hairy, but this feature is more marked upon the disk of the pronotum, the upper face of the posterior tibiae and at the end of the abdomen. The facial costa is sulcate, and the median carina of the pronotum is distinct upon the metazone, more or less distinct upon the prozone and cut by three incisions. The elytra are narrow and usually extend much beyond the abdomen. The posterior femora extend more or less beyond the tip of the abdomen. The anal cerci are broad at the base but are suddenly contracted on the upper side to half or less than half the width at their origin; the lower margin is straight and oblique, so that the apical two-thirds of the cerci is directed upwards but of equal width to the apex which is rounded. The last ventral segment is elevated and narrowed above at the sides with the upper outline, seen from behind forming a distinct but very obtuse angle.

Female: Length to tip of ovipositor .90 to 1.08 in.; length of elytra .75 to .85 in.

Similar to the male in color but somewhat

stouter and larger. The elytra extend to or considerably beyond the tip of the abdomen. The posterior femora do not generally reach to the tip of the abdomen. The upper plates of the ovipositor are much exserted, strongly upcurved and very acute while the lower plates are long and slender with a small or minute lateral tooth at the base.

Moline, Ill. August 27. 3 ♂'s, 12 ♀'s.

The species just described belongs to the *femur-rubrum* group of the genus but it is very distinct from this species and all others apparently. It was found in large numbers on the sand hill before referred to and afterwards a few specimens were found at widely scattered points in Rock Island and adjoining counties. It seems to inhabit only high sandy ground. The specimens found upon the sand hill were confined to that portion where the only vegetation was sand-burr (*Cenchrus*). They were colored so nearly like the yellow sand that they were difficult to see when only two or three feet away. The specimens I afterwards found were generally darker in color but they were invariably in the neighborhood of sand-burrs. In the lighter specimens the apical half or two-thirds of the elytra were almost perfectly transparent.

87. *Pezotettix viridulus*. This very pretty species was described from specimens obtained in this locality. It is by no means common however, being restricted to a few localities. It shows a decided preference for the sides of open grassy ravines. It is I think the first orthopteron to become mature from eggs hatched in the spring. I have found

full grown specimens as early as the 5th of June. The museum of the State laboratory of natural history contains a few specimens from Normal and Bloomington, Ill. My collection contains specimens from Bloomington, Indiana.

88. *Pezotettix occidentalis* Bruner. A very common species which makes its appearance as early as the middle of July and is abundant through August and September.

89. *Pezotettix scudderi* Uhler. This is probably as common as the last mentioned species and probably more evenly distributed throughout the territory which it occupies. *Occidentalis* certainly prefers grassy hillsides and tops, but *scudderi* is very frequently found along roadsides or in pastures. It reaches maturity about the first of August. It is tolerably certain that *unicolor* Thos. is but a synonym of this species. Mr. Uhler's specimens were from Baltimore and Rock Island, and it is not probable that I overlooked the species during four years collecting in the neighborhood of the last mentioned place. Mr. Thomas distinctly states that he was unacquainted with *scudderi*. So it is scarcely to be doubted that he redescribed this species as *unicolor*.

90. *Pezotettix gracilis* Bruner. This is *P. minutipennis* Thos. It is very rare in the north-western part of the state, but seems to be widely distributed, as specimens have been found at Moline, Bloomington, Urbana and Normal. It is a wood loving species. It has been taken as early as the first of July.

91. *Pezotettix autumnalis* Dodge.

The occurrence of this species was something of a surprise as it was thought to be a local Nebraska form. Its peculiar distribution here however leads me to think that it may be a widely spread species and explain perhaps why it has been supposed to be so restricted in its range. It occurs in abundance at one place near Colona, Henry Co., Ill., according to Professor Garman, who gave me specimens obtained at that point and saw nothing of it anywhere else, but several days search for the species was entirely fruitless, and I was almost inclined to think some mistake had been made in referring the specimens to that part of Illinois, when I stumbled upon the species at Cordova, Rock Island Co. There I found it abundant in a large orchard on the east side of a high hill. Careful search in that neighborhood did not enable me to find it any where else, and I have never found it in any other part of the state. The Colona specimens were captured Aug. 20th, 1885. Those captured at Cordova were taken the 28th of September, 1889.

92. *Pezotettix viola* Thos. This is a south-western form not generally distributed throughout the state. Said by Thomas to inhabit central and southern Illinois, but the museum of the State laboratory of natural history contains but two specimens captured at Running Lake July 15, and in September. Mr. C. W. Woodworth of Fayetteville, Ark., has repeatedly observed females of this species ovipositing in crannies of wood and stone frequently three or four feet from the ground.

93. *Pezotettix manca* Smith. This species is put in the list of Illinois Orthoptera on the strength of a single pair of specimens taken at Running Lake July 15, 1883.

94. *Tettix cristatus* Harr. According to Bolivar¹ *Batrachidea carinata* Scudd. is a synonym of *B. cristata* Harr. and the latter is transferred to the genus *Tettix*. I have a single specimen from Bloomington.

95. *Tettix triangularis* Scudd. I have seen but two specimens from this state; both are in my collection, one from Rock Island and the other from Bloomington.

96. *Tettix granulatus* Kirby. I have a specimen from Brookeville, Ind., and one from Moline, which I refer to this species.

97. *Tettix ornatus* Say. There is a single specimen in the museum of the State laboratory of natural history from Bloomington, Ill. which belongs to this species. I have a specimen from Bloomington, Indiana, which I place here. While these four species are all found in the state it is pretty evident that they are all rare, since out of all the hundreds of Tettiginae examined by me these seven individuals are all that I have seen of these species from Illinois or Indiana.

98. *Tettix arenosus* Burm. I refer to this species a large number of *Tettix* collected at various times by Mr. C. A. Hart of Illinois University and a limited number of specimens that I have collected in the north-western part of the state. I have formerly been accustomed to

consider this form as *T. rugosus* Scudd. but these specimens seem to be indistinguishable from *T. arenosus* Burm. as Mr. Scudder understands this species, and they do not seem to belong to the new genus *Paratettix* in which Bolivar places *T. rugosus* Scudd. Besides this species is too nearly allied to *T. cuculatus* Burm. to allow of its being put in a different genus. I am tempted to risk the opinion that *T. arenosus* and *T. rugosus* are too much alike to remain in different genera, if they are really different species. I have mature specimens that have been taken in every month from March to September inclusive, a fact which would seem to indicate that there are two or more broods of this species in a year, or that their breeding time is so irregular that they can not be divided into broods at all.

99. *Tettix cuculatus* Burm. This species is represented by numerous specimens taken in Rock Island and neighboring counties and by a few in Mr. Hart's collection. They were taken during the months of May, June, July, and August; I have three pupae taken at Hampton on May 5th and four taken at Moline, one on the 5th and three on the 8th. These pupae taken at about the same time in different localities are all ready to moult for the last time. This regularity would indicate that they have developed from eggs hatched in the spring, and if this is the case the title of *Pezotettix viridulus* Walsh to be the first grasshopper to be developed from eggs hatched in the spring will be in some danger.

¹ Essai sur les Acridiens de la Tribu des tettigidae, par Ign. Bolivar. Gand, 1887.

100. *Tettigidea lateralis* Say. This form is not uncommon at Moline but it is apparently much more common southward. I have a number of specimens collected from Aug. 9th to 16th; some of them are full grown but the majority are pupae in the last stage.

101. *Tettigidea polymorpha* Burm. I have not found this species in the neighborhood of Moline, but I have a number of specimens collected by Mr. Hart in the central part of the State.

PHASMIDAE.

102. *Diapheromera sayi* Gray. This species is not uncommon in Rock Island county and probably it is not less common throughout the State, though its form and habits render it too inconspicuous to be known by many. July 11th is the earliest date I have for its capture at Moline.

*103. *Diapheromera velii* Walsh, Proc. ent. soc. Philad., v. 3, 410.

104. *Anisomorpha buprestoides* Stoll. A single specimen in the mu-

seum of the State laboratory of natural history is labeled ♂ Saratoga, Union Co., Ill., July 1877.

MANTIDAE.

105. *Stagmomantis carolina* Linn. This species occurs not rarely in the southern part of the state.

BLATTIDAE.

*106. *Blatta germanica* Fab. Given on the authority of Thomas.

*107. *Periplaneta americana* Linn. Is in no collection of Illinois Orthoptera that I have seen, but I include it on the authority of Thomas.

108. *Periplaneta orientalis* Linn. Too abundant in old houses.

109. *Ischnoptera pennsylvanica* De Geer. Not found in Rock Island county, but it is common in the southern part of the state, where it is common under old logs.

*110. *Ischnoptera unicolor* Scudd. Given on the authority of Thomas.

A SUPPLEMENTARY NOTE ON DIABROTICA 12-PUNCTATA.

BY H. GARMAN, LEXINGTON, KY.

After the first part of my paper on this insect was published (*Psyche*, v. 6, p. 29) and the second part was nearly all in print, I received from Prof. C. V. Riley a copy of his notes on the habits and life-history of the species with per-

mission to use them in what I might subsequently write. It is not now possible for me to take advantage of this courtesy further than to add here some of the more important observations which his notes contain.

In an introductory paragraph he says: "Prof. H. Garman justly calls in question (*Psyche*, v. 6, p. 29; Feb. 1891) a statement made in *Insect Life* (v. 1, p. 59) where, by a typographical oversight, the Twelve-spotted Diabrotica is stated to have 'bred upon' instead of 'fed upon' melons. The error is self-evident from the language and from the tenor of the article which does not treat of larval habits at all but of the food-habits of the beetle."

"My knowledge of the corn-feeding habit of the larvae of this insect dates from April 30, 1883, when Judge Lawrence Johnson forwarded to me from Allenton, Wilcox Co., Ala., a number of larvae of which he wrote as follows: 'I sent you last week from Allenton specimens of the same destructive 'bud-worm' that I once mentioned as heard of but not seen. This is about the right time, for they are now going into the pupa stage and in the sand you will find one of the pupae. The worm leaves the corn after doing its mischief and the pupa referred to was found immediately under the stalk among the roots. I have never met with this worm except in the prairie regions of southern Alabama, but have heard of it in Mississippi.'"

From these larvae Professor Riley obtained adults May 21, 1883. He obtained larvae and beetles from Mississippi in 1884 where they are said to abound in corn fields from March to the middle of May. In June, 1886, they were reported to him as injuring corn at Mt. Vernon, Va., the result being a withering and drooping of the central parts, while in some cases the plants were killed as soon as sprouted.

The eggs were obtained by Professor

Riley from females confined with earth, and were placed in the soil as in the case of *D. longicornis*. Larvae collected June 18 from infested corn at Mt. Vernon, Va., changed to pupae June 22, and beetles emerged July 6, and produced eggs on the following day. Larvae from these eggs were first observed July 15. In this connection Professor Riley continues:

"The above indicates that this insect is at least double-brooded, in which respect it differs in habit from the closely allied *D. longicornis* which is single-brooded and winters usually in the egg, though occasionally in the adult state. The second brood of *Diabrotica 12-punctata* doubtless winters over, and deposits eggs about the young corn or other plants in the spring. Eggs of the last brood are also doubtless deposited in the fall, and winter over, as is usually the case with *D. longicornis*."

I am not at present prepared to believe that the female *D. 12-punctata* produces eggs in the fall of the year. Careful examination of examples taken whenever possible has failed to show ova in the ovaries at any time except in the early spring just before the first brood of larvae appear, and again when these larvae become beetles. After these adults have deposited their eggs, no gravid females occur again until the following spring. The search for them has been especially thorough in the fall and winter, and among all the examples dissected during these periods not a single one showed any signs of developed ova.

"The early stages of *D. 12-punctata* are scarcely different from those of *D. longi-*

cornis. The egg is larger, being .03X.02 of an inch as against .025X.015 in the case of *longicornis*. In color, instead of being dirty white it is dull yellowish. The hexagonal pits are exactly like those on the egg of *longicornis*, but are perhaps smaller, as there are 30-35 in its entire length as against 20 only in the smaller egg of *longicornis* "

The larva is said to differ from that of

D. longicornis in being larger and in the presence of the two small tubercles at the posterior edge of the caudal plate. The pupae of the two species are said to differ only in size.

Two dipterous parasites of *D. 12-punctata* are known to Professor Riley, one a Tachinid obtained from the larva, the other coming from the adult.

DESCRIPTIONS OF THE PREPARATORY STAGES OF TWO FORMS OF CERURA CINEREA Walk.

BY HARRISON G. DYAR, NEW YORK.

I have discussed the differences between the Eastern and Western forms of the imago in the Canadian entomologist¹ and in the present article consider the larval stages. The larvae of the two forms are much alike; the differences, after eliminating certain apparent ones due to individual variation, narrow to the greater prominence of crimson in *cinereoides* and its somewhat shorter caudal filaments or *stemapoda*, to use Dr. Packard's term. My examples of *cinerea* were nearly without crimson spots in the dorsal patches, but Professor Lintner has allowed me to see some notes by Professor Riley on this species in which they are described as present, and doubtless the character is variable. In the following some allowance should be made for individual variation.

CERURA CINEREA Walker. (Eastern form.)

Egg. Slightly more than hemispherical, the base flat. Color, dead black; diameter 1.2 mm.

Laid singly; the larva hatches by eating a hole in the side but does not devour the rest of the shell.

Larva: Second stage. Head rounded, the sutures deep, blackish brown; width 1 mm. Cervical horns brown, spinose as are the caudal filaments, the latter twice annulated with pale yellow. Body green, a blackish brown subdorsal line on each side, the space between them over the dorsum filled in with the same color except in three patches (1) on joint 3 posteriorly, joints 4 and 5 quadrate, (2) on joints 8-10 pointed anteriorly, and (3) a rounded one on joint 12. These are of a more yellowish green than the body color. Extensile threads black, once annulated with white. Length of larva 7 mm; of tails 5 mm.

Third stage. Head subquadrate, rounded,

¹ Can. ent., v. 22, p. 253.

flat in front, dead brownish black, the lower part paler and mottled centrally in front with a paler color. Antennae white; labrum and ocelli brown; width of head 1.3 mm. Cervical horns thick, heavily spinose, brownish black; several rows of minute piliferous tubercles on the body; tails spinose, dark red-brown, twice broadly annulated with yellowish and tipped with the same color. Body green, a purple-brown subdorsal line on each side which passes to the spiracles on joints 7 and 8, a little interrupted, especially on joint 5. The space between them is filled in with purple-brown on joints 2 and 3, on joints 6-9 and on joints 11 and 13, though not completely on joints 8 and 9, but with a trace of a dorsal line on the other joints. Venter whitish.

Fourth stage. Head higher than wide, rounded, a little flattened in front; a minute tubercle before the apex of each lobe; purplish black, finely mottled with yellow, green at the sides posteriorly; antennae white, ocelli black; width 2.2 mm. Cervical horns thick, covered by piliferous tubercles with about six rows of similar tubercles on each side of the body, only the upper two distinct. Color yellowish green. A triangular dorsal patch on joints 2 and 3 covering the cervical horns purplish black, mottled with little yellow spots; a larger patch on joints 4-9 elliptical, retracted at the segmental incisures, reaching the spiracle on joint 8, replaced centrally irregularly by yellow and broadly connected with a small patch on joints 10 and 11 which widens on 11 and is narrowly connected with the last patch on joint 13, replaced by greenish on the anal plate. Tails purple-brown, twice annulated with yellow.

Fifth stage. Head purplish black, green at the sides posteriorly, reticulated where the colors meet; mottled with yellowish in front rather broadly but more narrowly to vertex. Clypeus and mouth purplish, jaws black. Antennae white; width of head 3.2 mm. Cervical shield large, smooth, with angulations at the corners, representing the "horns" of the

previous stage. Body slightly elevated dorsally at joint 3 posteriorly, but without a process on either joints 3 or 4. Tails spined, purplish black, twice annulated with greenish yellow. Body yellow-green speckled on the sides with yellow and with small brown piliferous spots. The dorsal patches are much as before, the first triangular on joints 2 and 3 covering the top part of the smooth punctured corners of the cervical shield, ending on joint 3 posteriorly, covered with little yellow spots and narrowly bisected by a pale dorsal line. The other patches are confluent; beginning in a point on joint 4 the second patch widens, contracted at each suture to below the spiracle on joint 8 and over the subventral space, just enclosing the spiracles on joints 7 and 9; it narrows on joints 8 and 9 joining the third patch on joints 10 or 11 (in different examples). The third widens a little on joint 11 and narrows on joints 11 and 12 where it joins narrowly the last patch, which widens on joints 12 and 13 and contracts a little at the anal plate. The patch on joints 6-8 is much mottled by large yellow (or partly crimson) spots and on the anal plate by whitish. Spiracles purple-black with a central white line and black marks around them; the lateral yellow specks here segregate to form an obscure stigmatal line. A row of purple-black subventral blotches irregularly represent the feet on the apodal segments. Venter a little whitish with a narrow ventral line posteriorly; feet green. Two erect black spines at the anus. As the stage advances, yellow spots appear in the dorsal patch on the 3rd-5th abdominal segments, the sides are strongly sprinkled with little brown spots and the dorsal band becomes purplish edged with yellow but with no distinct crimson.

Cocoon. Constructed on bark of gummy silk and bits of bark and wood, like that of the other species of *Cerura*.

Food plants:—Poplar (*Populus*) and willow (*Salix*).

Larvae from Dutchess Co., New York.

CERURA CINEREOIDES Dyar. (Western form.)

Egg. Slightly less than hemispherical, the base flat. Color, dull brownish black, smooth. Diameter about 1 mm. Duration of this stage, eight days.

Larva: First stage. Head dark red-brown. On joint 2 are two brown processes, minutely spined. Joint 13 has two "tails" 3 mm. long, brown, twice broadly annulated with pale yellow and minutely spined. The body is brown with three dorsal pale yellow patches, on joints 2 to 6, 8 to 10 and 12 respectively, the posterior one faint. Venter and legs pale whitish. Length of larva, exclusive of the tails, 4 mm. It spins a slight web on the surface of the leaf to which it clings.

Second stage. Head red-brown with two blackish shades in front. Processes on joint 2, which is somewhat swollen, thick and spined. Tails twice broadly annulated with pale yellow. The body is red-brown with a transverse row of minute spined points on each segment. The dorsal patches are as in the previous stage, but the one on joint 12 extends also on joint 11. The venter and legs are pale yellow. The extensile threads in the "tails" are pale whitish at base, the rest dark brown, once broadly annulated with white. They are extended in the same manner as the "horns" of a larva of *Papilio*, the base appearing first, followed by the remainder of the part, reversing itself as it is extruded. These the insect lashes over its back if disturbed. Length 6 mm., tails, 4 mm.

Third stage. Head brown, densely marked with small yellow spots, but leaving two wavy lines of the ground color in front, paler at the sides posteriorly. Antennae whitish. Joint 2 is somewhat swollen and bears two thick processes about 1 mm. long covered with pointed tubercles. Each segment has a row of similar tubercles each bearing a short fine hair. The dorsal ones on joints 3, 6, 7, 8, 9 and 11 are rather larger

than the others. The tails are spinose, green but brown above at the base and twice annulated with brown towards the ends. Length 4.5 mm. The body is yellowish green, the red-brown of the dorsum being reduced to a subdorsal brown line on each side which join on the last segment and are connected over the back on joints 2 and 3 by brown mottlings between the processes, by a large patch on joints 6, 7 and 8 and another on joint 11. The large spot is paler centrally. Later the subdorsal line disappears and the brown dorsal patches are connected by an obscure dorsal line. Length of body, 8 to 12 mm.

Fourth stage. The head is partly retracted under the skin of joint 2, purple-brown before, yellowish green at the sides behind the eyes, the upper two thirds densely covered with small pale yellow spots, but leaving two lines of the ground color in front. A few minute hairs over the surface. Antennae white. The body is slightly elevated dorsally at joint 3. Color green, with a yellowish tinge at the bordering of the dorsal patches, which are four in number and purple-brown. The first is on joints 2 and 3, triangular, covering the upper part of the spined processes of joint 2, partly divided by a green dorsal line anteriorly; the second is on joints 4 slightly and 5 to 9, elliptical, reaching below the spiracles, pointed anteriorly, and connected posteriorly with the third patch on joints 10 and 11, which widens posteriorly and narrows abruptly to the fourth patch on joints 12 and 13 which is partly replaced by the ground color. The two last extend over the subdorsal spaces. All are partly mottled with pale yellow and contain conical tubercles, each surmounted by a short hair. The sides of the body are sprinkled with brown and whitish specks and have a few short fine white hairs. Venter white. Tails purple brown at the basal half above and twice annulated with brown at the extremities. They are still spinose and the extensile threads are black with a white ring.

Fifth stage. Head as before, but at ma-

turity the yellow spots are quite faint and a blackish shade extends up from the eyes widening to the vertex. Jaws black; antennae white. Body smooth, the conical piliferous elevations represented by brown spots. The processes on joint 2 are relatively much smaller and without spines. A slight dorsal elevation on joint 3 posteriorly, just covered by the end of the first dorsal patch. Tails spined as before and marked the same. The extensile threads are dark purplish black, once annulated with purplish white. Dorsal patches much as before, the second, third and fourth strongly confluent, the second and third most so. The second is marked centrally with many dark crimson spots, with which color all the patches are narrowly edged inside the yellow border. At maturity the color of all the patches fades to lilac and a number of yellow spots appear in the second one, its outline anteriorly becoming irregular. Body yellowish green with a transverse row of purple-brown spots on each segment, more numerous subventrally, and a number of whitish spots, which are thickest at the spiracles giving the appearance of a stigmal line. These are also found on the dorsal patches, and on the anal plate are partly confluent, replacing the purplish brown. The spots on the patch on joint 2 are yellowish like those on the head. Spiracles dark reddish brown, partly surrounded by a similarly colored but paler spot. Venter whitish, at maturity green, a reddish ventral line on joints 12 and 13. Purple spots on the bases of the legs and on the legless

segments. Feet green, marked with brownish.

At the anus, beyond the upper anal plate, are two erect spiny hairs which serve to project the frass to a considerable distance. Length of larva 35 mm.; of tails 5 mm.

Cocoon. Formed on a piece of wood first of gummy silk which is strengthened by many little pieces of wood bitten off from inside. When finished, it is elliptical, quite hard and of the color of the wood or bark on which it is made. Length about 30 mm.; width, 13 mm.

Pupa. Cylindrical, tapering slightly at both extremities, somewhat flattened. Color pale brown, venter yellowish and a dark dorsal line. Wing and leg cases greenish. Abdomen very minutely punctured. Wing cases creased. Length 18 mm.; width 6 mm.

The duration of the first larval stages was from three to six days, the last two seven days. The pupa state lasts through the winter.

Food plant. Probably Willow (*Salix*).

Larvae from Los Angeles Co., California.

TWO NEW TACHINIDS.

BY C. H. TYLER TOWNSEND, LAS CRUCES, N. M.

The following two species of Tachinidae, recently received from Professor F. L. Harvey, of Orono, Maine, among a lot of other Diptera for determination, prove to be new. As he desires to use

the names in a future paper of his, I submit descriptions of them.

Tachina clisiocampae n. sp. ♂. Eyes brown, very thinly and indistinctly hairy;

front at vertex about one-half the width of the face below, at base of antennae about one-third the width of the head; frontal vitta black, of equal width, with a row of black bristles on each side extending fully half-way down the cheeks, the front on each side golden, this color extending nearly as far down on the cheeks as do the frontal bristles; vertex blackish with longer and stouter bristles, three on each side posteriorly inclined, and a pair on the ocellar area anteriorly inclined; antennae blackish, a little shorter than the face, second joint elongate, the third joint about twice the length of the second; arista 3-jointed, basal half somewhat thickened; vibrissae removed from the oral margin, the facial ridges with a few bristles which do not extend quite half way up the face, but usually as far as the lowermost frontal bristles; proboscis blackish, palpi reddish-brown, black bristly; face and cheeks silvery, in places with a golden sheen, lower cheeks cinereous with short black bristles; occiput blackish or cinereous, covered with dense, coarse, whitish hair except a narrow bare space opposite the vertex, the edge with a fringe of black hairs. Thorax black above with six gray vittae, the middle pair sometimes coalesced, covered with short black hair and with rows of black bristles; humeri and pleurae more or less cinereous, black pilose; scutellum dark flesh-red, somewhat black at base, with black hair and eight marginal macrochaetae which reach at farthest about to the middle of the second abdominal segment. Abdomen long oval, somewhat conical, black, thickly covered with rather short black bristles becoming longer behind, the basal half of the second, third and fourth segments cinereous usually more distinct on the sides, the second segment usually with a flesh-red tinge on the sides; the first and second segments each with one dorsal pair of macrochaetae near the hind margin, the third segment with two pairs, the anal segment with many stout bristles; venter black, the bases of the segments cinereous

except the anal, black hairy. Legs black, black hairy, femora somewhat cinereous, femora and tibiae with black bristles and a few macrochaetae; claws black, elongate, pulvilli dirty yellowish. Wings hyaline, costo-basal portion tinged with yellowish, curvature of the fourth vein with a wrinkle appearing like a stump; veins black, very stout towards the base of the wing, the base of the costa with black bristles, the third vein bristly above and below at its origin; tegulae white with yellowish margin, halteres very dusky, nearly black.

Length of body 12 mm; of wing 9½ mm.

Described from two specimens, bred from larvae of *Clisiocampa sylvatica*. Orono, Maine. The eyes in this species cannot be said to be hairy, although thin, scattered hairs are distinctly visible with a high-power lens. I base my generic reference of this species particularly on the strongly elongated second antennal joint as compared with the third, and the wrinkle at the curvature of the fourth vein, characters of the true *Tachina* sens. Schiner. This species agrees exactly with Schiner's description, except the one remark, "eyes bare." Some authors seem inclined to abandon this much patronized genus, but I think we can not do better than accept it as restricted by Schiner (Faun. austr., Dipt., 1, 472.)

Phorocera promiscua n. sp. ♀. Eyes brownish, thinly, indistinctly hairy; front broad, a little more than one-third the width of the head; frontal vitta nearly black, of equal width, cleft behind where a prong widens outward on each side of the ocelli; a row of bristles on each side of the vitta, extending about three or four bristles below the

base of the antennae, two orbital bristles outside each row; a long pair of bristles directed backwards on the vertex, and a shorter pair directed forwards on the ocellar area; the front golden on each side, this color extending as far down on the cheeks as do the frontal bristles, the rest of the cheeks and face gray; facial ridges with bristles extending fully or more than half way up the face; antennae not quite so long as the face, blackish, second joint short, the third joint nearly or quite three times as long as the second; arista black, two-jointed, the basal half thickened; vibrissae somewhat removed from the oral margin; proboscis blackish, palpi light reddish-yellow, black bristly; lower cheeks dark gray, with black bristles; occiput ashy, gray pilose, with black bristles on the borders. Thorax above leaden gray, with four black lines, with numerous black bristles becoming longer behind, and covered with short black hairs; humeri and pleurae gray, the bristles and short hairs of the dorsum extending below on the sides of the thorax; scutellum dull gray, darker at the base, covered with short black hairs, and with eight marginal macrochaetae, the longest pair reaching the base of the third abdominal segment, a shorter decussate pair between them. Abdomen ovate, first segment black above; second and third segments leaden gray, densely covered with short black bristles, each one arising from

an opaque black dot; anal segment obscure golden pollinose, edges of segments black; a dorsal pair of weak macrochaetae near the hind margin of the first segment, a stronger pair on the second, four pairs on the third, and about twice as many on the anal segment; venter dull gray, anal segment obscure golden as above, incisures and median line black. Legs black, femora and tibiae black bristly; claws short, pulvilli dusky. Wings grayish hyaline, fourth vein without wrinkle or stump, third vein bristly above and below at its origin; tegulae white, halteres dusky brown.

Length of body 7 to 7½ mm; of wing 5½ to 6 mm.

Described from three specimens, bred from larvae of *Clisiocampa sylvatica*. Orono, Maine. I believe I am right in referring this species to Phorocera, although in some specimens the bristles on the facial ridges do not extend more than half way up the face. This species seems to be near *Tachina* (*Masicera*) *armigera* Coquillett (Insect life, 1, 332), which however is said to have the eyes bare. I would not be surprised if the latter should prove to be a Phorocera.

EDWARDS'S BUTTERFLIES OF N. AMERICA.

The eleventh part of the Butterflies of North America, just issued, is in every way equal to its predecessors. For the first time in this third series, each of the three large quarto plates, with the accompanying text, is given up to a single and relatively little known species of butterfly, two of them to species of Satyrinae, a group which nowhere in the world has found so complete a treatment as in America, at the hands of our

author. Excepting for the intermediate larval stages of *Satyrus meadii*, every single stage of the creature's life is represented, usually by more than a single figure, and all in that exquisite and finely exact style we have become accustomed to in this work, but which can never be too highly praised or too fully appreciated. Such illustrations lie at the very foundation of the exact knowledge of butterflies, and are the key to any proper understanding of their real relationships.

The butterflies treated of are *Apatura*

flora. *Satyrus meadii* and *Chionobas chryxus*, all of them living from five hundred to a thousand or two miles from Mr. Edwards's home, where they were bred and studied. This shows at once the opportunities to be overtaken by any zealous student, and renders possible thorough acquaintance with our entire fauna. Mr. Edwards hints here and there at some of the difficulties of the work, to have overcome which, even partially, in the case of such distant and secluded insects as this *Satyrus* and this *Chionobas*, is a high merit indeed! *Apatura flora* is an inhabitant of our extreme southern border; *Satyrus meadii* lives at moderate altitudes in restricted localities in Colorado, New Mexico, Arizona and Montana; and *Chionobas chryxus* at higher elevations in the Rocky Mts. from Colorado to British America and, if with Mr. Edwards we include calais in the species, also across the continent in the higher north. In all three species the caterpillars hibernate in early life, but the history of the species as given here presents nothing of unusual interest and closely resembles that of their nearest allies. Eighty-one figures, most of them colored and many much magnified, are given on the three plates.

FIFTH REPORT OF THE U. S. ENTOMOLOGICAL COMMISSION.—Dr. Packard's treatise on forest insects, only just issued though completed over three years ago, closes the work of the U. S. entomological commission. It is based on a former "bulletin" of the commission, but is vastly enlarged and abounds in illustrations many of which, unfortunately, conform to the standard of those published years ago by the agricultural department, but are much inferior to those now published by its division of entomology. One can quickly see by a glance through the volume of more than 900 pages, 40 plates and 300 cuts in the text that it is a veritable store house of facts and observations, and is worked out in the same way as the previous bulletin. It has the faults of many government publications that the material is too

little sifted and digested, but there can be no doubt of its great service. A systematic index of the insects is sadly needed; the very plan of the book particularly requires it.

PERSONAL NOTES.—Mr. William Beutenmüller has recently been appointed curator of the department of entomology in the American museum of natural history in Central Park, New York City.

Mr. C. H. Tyler Townsend has just taken the post of entomologist at the agricultural experiment station at Las Cruces, New Mexico.

PROCEEDINGS OF SOCIETIES.

CAMBRIDGE ENTOMOLOGICAL CLUB.

8 February, 1889.—The 143d meeting was held at 156 Brattle St., the president in the chair.

Mr. G. Dimmock read part of a letter from Mrs. C. M. Winston describing the resemblance of some "walking-sticks" to the plants on which they lived.

Mr. Dimmock showed a collection of Cynipidae with their galls given to the Club by Mr. C. P. Gillette of Iowa; it was voted to give the collection to the Boston society of natural history.

Mr. J. H. Emerton showed specimens of *Hypochilus*, a spider recently described by Geo. Marx which has the cribellum and calamistrum like *Filisata* and also four respiratory sacs like the *Theraphosidae*. These specimens were collected by Miss Mary T. Palmer at Manitou, Col.

Mr. Emerton also made some remarks on the spiders collected by the Messrs. Smith of Brooklyn, N. Y. in the province of Matto Grosso in Brazil.

Mr. S. H. Scudder explained the history of a newspaper account of a pretended great flight of butterflies at Westerly, R. I.

Mr. H. Hinkley showed some artificial insects made by Japanese and made some remarks on the breeding habits of *Lepidoptera*.

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CAMBRIDGE ENTOMOLOGICAL CLUB.

The regular meetings of the Club are now held at 7.45 P.M. on the second Friday of each month, at No. 156 Brattle St. Entomologists temporarily in Boston or Cambridge or passing through either city on that day are invited to be present.

A very few complete sets of the first five volumes of PSYCHE remain to be sold for \$25. Vol. I will not be sold separately.

SAMUEL HENSHAW, Treas.,
Cambridge, Mass.

The following books and pamphlets are for sale by the CAMBRIDGE ENTOMOLOGICAL CLUB:

Burgess, E. Contributions to the anatomy of the milk-weed butterfly, *Danaus archippus*. Boston, 1880, 16 p., 2 plates. . . . 1.00

Grote, A. R. Revised Check list of the North American Noctuidae. Part I. *Thyatirinae-Noctuidae*. Bremen, 1890. 50

Hitchcock, Edward. *Ichthyology of New England*. Boston, 1858 1.50

Scudder, S. H. The earliest winged insects of America: a re-examination of the Devonian insects of New Brunswick, in the light of criticisms and of new studies of other paleozoic types. Cambridge, 1885, 8 p., 1 plate .50

Scudder, S. H. Historical sketch of the generic names proposed for Butterflies. Salem, 1875. 1.00

Scudder, S. H. The pine-moth of Nantucket, *Retinia frustrana*. col. pl. Boston, 1883. .25

Scudder, S. H. The fossil butterflies of Florissant, Col., Washington, 1889 . . . 1.00

Stettiner entomologische Zeitung. Jahrg. 42-46. Stettin, 1881-1885. 5.00

U. S. Entomological Commission. Fourth Report. Washington, 1885. 2.00

SAMUEL HENSHAW, Treas.,
Cambridge, Mass.

TACHINIDAE WANTED.

Named or unnamed Tachinidae wanted in exchange, or for study, from any part of North America including Mexico and the West Indies.

C. H. TYLER TOWNSEND,
Las Cruces, New Mexico.

PSYCHE.

A DECADE OF MONSTROUS BEETLES.

BY SAMUEL H. SCUDDER.

Monstrosities among insects have always a unique interest; early in my entomological career I began the collection of facts regarding them, planning a general survey and classification of the entire literature of the subject, which I have not only never fully carried out, but which the multiplicity of other work will prevent my undertaking seriously for a long time to come, if ever. On that account I have thought it well to publish the few original cases which have come into my hands, and of which I have made notes, together with illustrations of them. None of them are of exceptional interest, but one or two are not a little remarkable. They all belong to the Coleoptera, and all but one to one of the two families, Carabidae and Scarabaeidae. The drawings were made by Messrs. J. H. Emerton and Edward Burgess.

CARABIDAE.

Carabus serratus Say. ♂. A right fore leg in which the femur is normal but the tibia unusually thick at base; only a short distance beyond (about $\frac{1}{3}$ the distance) it divides into two branches, each of which is at tip very nearly, if not quite, as large as the normal tibia.

The inner one is not so well developed as the outer and may therefore be considered the supernumerary limb. The inner is slightly shorter. The tarsal joints of each are five in number, and in the inner are slightly shorter than in the outer; this is especially the case with the terminal joint. In the inner leg the terminal joint is not inserted in the middle of the previous but upon the middle of its inner half and at the same time it is slightly curved inwards as if to give room for another joint, which indeed I think once existed, for there is a pit upon the middle of the outer half of the terminal surface of the penultimate joint just large enough for the reception of such a joint, and this too would account for the unusual shortness of the remaining terminal joint. The terminal joint of the outer leg is provided with a normal pair of claws; the other has only a slightly bent, very minute, and very short central and undivided process.

The outer tibia is normal in shape and in armature; the inner exhibits above a longitudinal groove broad and deep in the middle, becoming abruptly shallow and narrow anteriorly, and terminating by a union of the borders at

the very margin of the limb; posteriorly it shallows, narrows gradually, and terminates in a point back of the division of the primary tibia. A similar but not so distinct groove is seen beneath, and at the tip beneath three instead of two prominent spines are visible. It is evident, then, that the inner portion of this supernumerary leg is exhibiting a tendency itself to divide in two places: at the tip of the tibia and at the tip of the tarsi; the only indication in the parts lying between these two points is in the very trifling greater width of all the tarsal joints.

This specimen was received from Mr. Frederick Blanchard of Lowell through Mr. E. P. Austin. It is now in the Museum of comparative zoology in Cambridge.

Dyschirius sp. (Pl. 2, fig. 7). Of this species I have only notes and rough sketches referring to the right front tarsus. The 1st and 2d joints are normal; the 3d is longer than usual, bent a little forwards, and bears at the bend a 4th joint and at the tip another; that at the tip bears a normal 5th joint with claws as usual only a little smaller; that at the bend bears an altogether similar 5th joint only the claws are still smaller, scarcely curved, and a second still more abortive pair of claws is found at the outer edge close to the tip, thus showing signs of double bifidity.

The specimen was shown me by Dr. J. L. LeConte, but its origin I do not know.

Amara musculus Say (Pl. 2, fig. 2). The right antenna is 12-jointed; the left

antenna is affected as follows: joint 1-6 normal (the first not shown in the figure) 7th a very little enlarged apically, the better to support the abnormal 8th joint, which is depressed and beyond the base, here slightly larger than usual, expands and forms a sublenticular mass slightly longer than broad, with a distinct straight impressed line down the middle of the upper inner surface (as if made up of two connate joints); it is of the normal length. Each of these two lateral halves bears an appendage of four almost precisely similar joints, the exact counterpart of those of the opposite antenna except in being a very little smaller though of the same proportions; the lower is borne at the extremity of the lower half, and is continuous with the antenna; while the upper is attached to the upper outer angle of the upper half and trends a little away from the normal direction; the 9th, 10th and 11th joints of this half are a trifle shorter than those of the other more normal half.

The specimen came from Massachusetts, and was received from Mr. Samuel Henshaw.

Galerita janus Fabr. (Pl. 2, fig. 1). The specimen of this species which I have to describe briefly, is not greatly malformed. Malformation occurs in the right hind leg, the femur of which is perfectly natural, and the tibia is of normal length and clothing, but is perhaps a little swollen, and considerably twisted from a point slightly beyond the base, the curvature being more or less sinuous, at first and most strongly backward, at

the apex in the opposite direction. It bears the usual spines at the apex, but the longer inner one is curved beyond the middle. All that remains of the tarsus is a spine-like appendage which takes its place,—an appendage less than one half the diameter at base, about as long as twice the width of the tibia, tapering slightly, and bluntly rounded at tip.

The specimen was obtained by the late Mr. F. G. Sanborn, May 10, 1868, in West Roxbury, Mass., and is now in the museum of the Natural history society, Boston.

Chloenius tomentosa Say (Pl. 2, fig. 3). The single specimen before me shows a somewhat simple malformation in the left middle leg. The femur and tibia are normal, excepting that the tibia is somewhat more enlarged than natural at the apex, more resembling in this respect the fore tibia, expanding broadly at its extreme apex. Here, besides the normal spurs, there is the attachment of what appear to be a triple series of tarsi. The middle one is reduced to a mere conical bulb between the other two, bristling at its apex with spines of a moderate length; one of the others consists only of what may perhaps be regarded as the basal half of the metatarsus extending at right angles outward, bluntly rounded at the apex, but showing at the extreme apex and just at its side the points from which a couple of spines, probably of moderate size, have been broken off; the inner is the only developed tarsus, and this is malformed in two ways: first that the metatarsus

is rather stouter than normal, a little curved, and is followed by a short supernumerary joint only a little smaller than the normal second joint; and second, that the whole tarsus is bent at right angles between the supernumerary joint and the second (this bend is not seen in the figure); unless indeed these two joints may be regarded as one, constricted and bent at right angles in the middle.

This specimen was obtained by Mr. F. Stratton at Natick, Mass., and is now in the museum of the Natural history society, Boston.

LAMPYRIDÆ.

Telephorus rotundicollis Say (Pl. 2, fig. 5). A right antenna in which the first joint is longer than usual; the second is of ordinary length but as large at base as at apex and bears two joints, one at the apex, a normal third followed by eight joints as usual, and the other a short, depressed, thickened joint articulated on the apical half of the anterior face of the second joint, and followed by five joints, the first of which is like the preceding, while the rest are slender, elongated joints, somewhat like the normal joints but evidently useless and perhaps immovable (by will) in life, together curling backward.

In the drawing the normal third bears a curved appendage which I did not see; and the third joint of the supplementary palp, being bent and folded, is represented as if made up of two small joints.

This specimen was shown me by Dr.

J. L. LeConte, but its origin I do not know.

SCARABAEIDAE.

Lachnosterna fusca Fröh. (Pl. 2, fig. 8). This is on the whole the most singular monstrosity with which I have met. It concerns the middle leg of the left side. The femur of normal length is extraordinarily enlarged so as to form a cuneate piece, at its apex nearly as broad as half the length of the femur. From both the anterior and posterior extremities of the expanded subcompressed apex there arises an independent tibia; the anterior is sub-normal, having all the parts but the tibia somewhat reduced in size and of more uniform width throughout, the tarsi entirely normal and complete. The set of members arising from the posterior extremity of the expanded femur consists of a tibia similar in length and in general appearance to the other but stouter and deeply cleft on its outer face to the depth of fully one third its length. Each of the uniform halves thus cleft presents the normal pair of apical spurs and is followed by a series of tarsi in general respects normal but of rather diminished size, and the upper having the terminal joint not bullate at the extremity but terminating in a conical point without any claws.

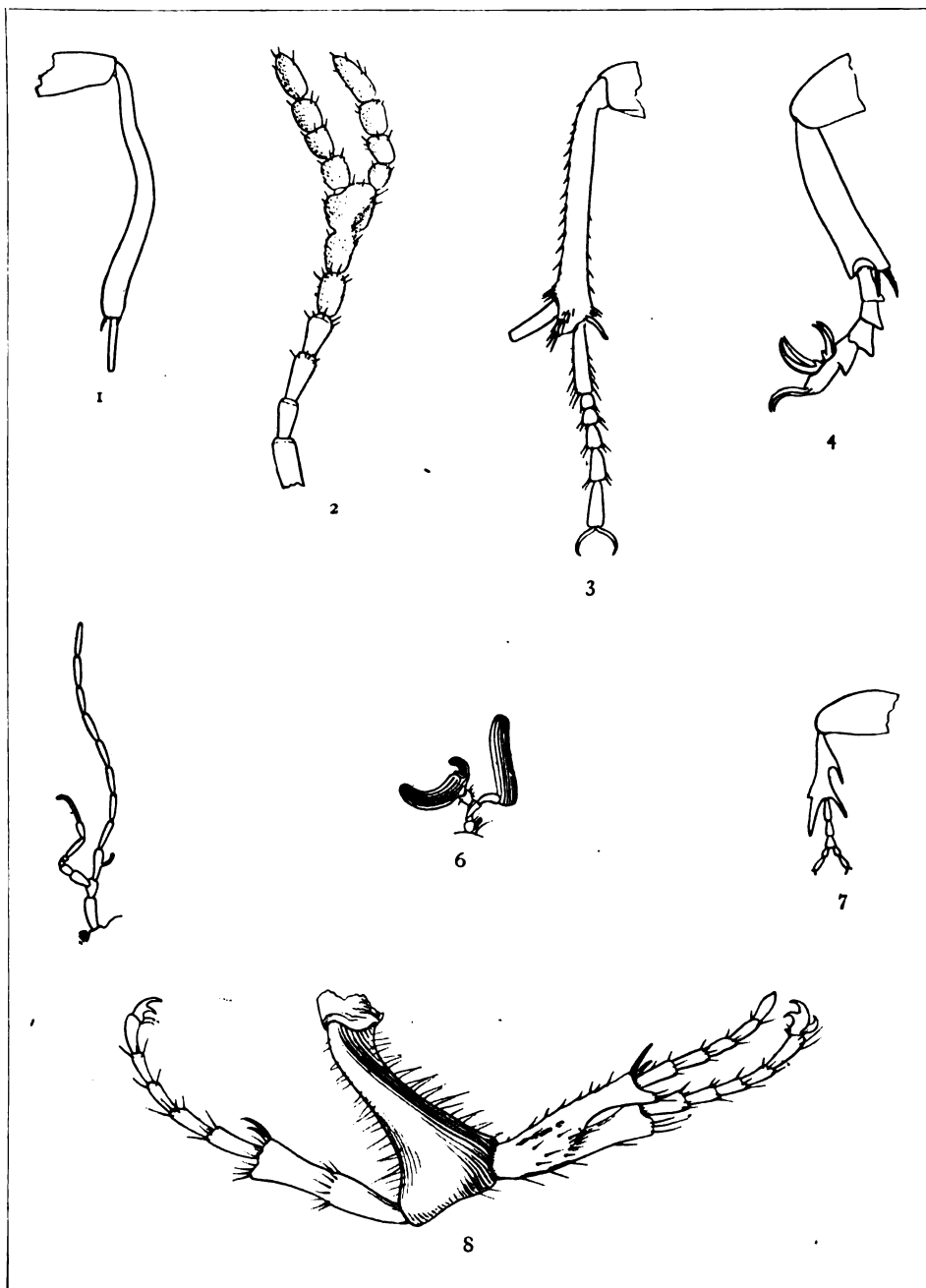
The origin of this specimen I do not know; it is now in the Museum of comparative zoology at Cambridge.

Polyphylla decemlineata Say (Pl. 2, fig. 6). A right antenna in which the first and second joints are normal,

the third not larger than usual but bearing two fourth joints: the first articulated at the tip, the second articulated on the anterior face, the articulation occupying all of it but the part close to the base; both fourth joints are formed in general like the normal fourth joint; the first is directed backward and bears a normally formed set of laminae, seven in number, but small and directed subparallel to, though not so much curved as, those of the left antenna; in this case the secondary fourth joint differs from the normal fourth only in being smaller to about the degree that the laminae are smaller than normally. In the second case the fourth joint is greatly swollen and bears at its broad apex a very peculiar set of lamellae, which from the first show their intention to divide; three are undivided, but irregular in shape, more or less imperfect, and attached not by one extremity but near the middle, the longer portion directed anteriorly and a little inward; the shorter in an opposite direction, each curved downward; the first two of these are flat laminae, a little thickened at the point of attachment; the third is enormously thickened at this point and produced into a triangular projection, upon either side of which are attached the remaining laminae, four anterior and three posterior, the division of this portion of the bifid antenna taking place at this point.

This specimen was shown me by Dr. J. L. LeConte, but I did not learn its origin.

Cotalpa lanigera Linn. Instances are quite frequent in which the longer



anterior claw on one or many of the feet shows a tendency to division, being in some instances cleft on the posterior outer edge from a little below the tip one-sixth the distance to the base of the claws. Mr. E. P. Austin first drew my attention to this feature, and informs me that he has noticed it in a considerable number of specimens he has examined. Nearly every specimen I have examined shows some trace of it, from a tubercular enlargement of the spot whence the bifurcation proceeds, up to the amount I have mentioned above. Half of the four specimens in the Harris collection in the Boston society of natural history have it.

Trichius piger Fabr. (Pl. 2, fig. 4). A right hind leg in which the femur is normal; the tibia is slightly shortened and thickened, but terminated by the usual two spines; the tarsal joints are curved rather strongly upward, and instead of being uniformly long, slender, and gradually thickened at the apex, are (except the last) uniformly and nearly equally short and stout, nearly triangular, with the apex prominent beneath; they are scarcely longer than their extreme height at apex. The last joint is conical, truncated, a little smaller only at tip than at base, about twice as long as it is broad at the base, and very slightly curved outwards; it bears at

the tip a pair of scarcely divaricating claws a little shorter than the normal; but in addition to this it also bears at the very base of the joint, above, two more pairs of claws; one pair so near the base as to appear at first sight to be attached to the penultimate joint, a little smaller than, and facing in the same direction as the apical pair, and also scarcely divaricate; the other, just beyond, also scarcely divaricate, larger than either of the other pairs, but still smaller than the normal claws, and facing in an opposite direction to the other two pairs; apparently the claws are all freely moveable.

The specimen was obtained at Medford, Mass., by the late Mr. F. G. Sanborn, and is now in the museum of the Boston society of natural history.

EXPLANATION OF PLATE 2.

1. Right hind leg of *Galerita janus*.
2. Left antenna of *Amara musculus*.
3. Left mid leg of *Chloenius tomentosus*.
4. Right hind leg of *Trichius piger*.
5. Right antenna of *Telephorus rotundicollis*.
6. Right antenna of *Polyphylla decemlineata*.
7. Right fore leg of *Dyschirius* sp.
8. Left midleg of *Lachnosterna fusca*.

PERSONAL NOTES.—Mr. C. W. Woodworth, recently entomologist to the Agricultural experiment station at Fayetteville, Ark., has accepted a similar position at the station in Berkeley, Cal., and has already moved to his new post.

Mr. Theo. D. A. Cockerell, of England, formerly secretary of the Colorado biological association, has been appointed curator of the museum in Kingston, Jamaica. After June 24 his address will be Institute of Jamaica, Kingston, W. I.

DESCRIPTION OF THE PREPARATORY STAGES OF CALLOSAMIA PROMETHEA DRURY.

BY WM. BEUTENMULLER, NEW YORK.

Egg.—Oval, slightly flattened above and below, sordid white. Height 1.20 mm. Width 1.50 mm. Laid June 14. Emerged June 24.

Larva: First stage.—Head dull black with a sordid white transverse band across the middle. Body greenish yellow with a transverse black band on the anterior and posterior portions of each segment, running to the sides.

Along the dorsum are two rows of tubercles, and a row along the subdorsal and another row along the sides below the spiracles. All the tubercles are yellow, except those on the first segment and the two dorsal pairs on the second and third segments and those on eleventh and twelfth segments, black. Each of the tubercles are also furnished with about five bristle-like hairs, which are black. Length 3 mm. Duration of this stage seven days.

After first moult.—No change except that the larvae are more conspicuous. In some individuals of the brood the two tubercles on dorsal region on the second and third segments are yellow instead of black as in the previous moult. Length 10 mm. Duration of this stage five days.

After second moult.—The body is now whitish green, with the tubercles black, except the two dorsal pair on the second and third segments and the one on the eleventh segment bright yellow, with their bases black; these six tubercles remain present in all the subsequent stages, while all the remaining tubercles gradually become reduced into mere piliferous spots. Anal plates yellow margined with black. Head yellow, with a black transverse band and a black spot on each side of the top. All the feet yellow, abdominal ones with a black spot on the outer side of each. The transverse bands

across the segments are now quite faint, and in some specimens they are broken or absent. Length 20 mm. Duration of this stage four days.

After third moult.—The body color is the same as in the previous moult. The four tubercles on the second and third segments are now bright orange yellow and the one on top of the eleventh segment lemon yellow; all other tubercles black and much smaller than the ones just mentioned. Thoracic feet and anal legs yellow, abdominal legs same as in the last stage. Head yellow with two black spots on each side. Length 24 mm. Duration of this stage three days.

After fourth moult.—Body entirely green, with a whitish hue. The transverse bands have now disappeared. The four tubercles on the second and third segments are now quite prominent, coral red, and the one on the eleventh segment lemon yellow. All the other tubercles are reduced to mere piliferous spots. Head and legs yellowish green. Length 30 mm. Duration of this stage five days.

After fifth or last moult.—Same in all respects as the preceding moult, except that the larva becomes stouter and more prominent in appearance. Length 39 mm. The full grown larva measures about 55 mm. Duration of this stage five days.

Food-plants.—Sassafras, tulip-tree, linden, spicebush, sweet-gum, choke-cherry, plum, pear, ash, Magnolia, Halesia, etc.

The early stages of this species were made first known by Dr. C. V. Riley, (4th Mo. rep. p. 121) who gives only four moults, while the brood I raised moulted five times. The mature larva was first figured by Abbot and Smith (Ins. Ga., v. 1, p. 91, pl. 46) and again subsequently by various writers.

PREPARATORY STAGES OF HETEROCAMPA UNICOLOR PACK.

BY HARRISON G. DYAR, NEW YORK.

The eggs were not observed but I believe that I have found the larva in its first stage which is as follows:—

First stage.—Head cordate, black, shiny, a large white patch in front covering the clypeus and labrum; width .4 mm. Body enlarged dorsally at joint 2 and bearing on each side of the cervical shield a smooth elongated process (.4 mm.) of uniform thickness tipped by a fine short hair. The anal feet are prolonged into a pair of smooth processes or imperfect stemapoda, a little enlarged at the end and minutely hairy below. Body cylindrical, smooth, shiny, pale green with four fine red-brown lateral lines on each side, the uppermost faint; three patches of red-brown, the first on joint 2 dorsally, the second on joint 7 dorsally and laterally and the third on joint 11 and joint 12 anteriorly dorsally running forward upon joint 10 above the feet. Cervical shield and "horns" and anal plate black. Stemapods 1 mm. long, green, twice ringed with black, the swollen ends red-brown. The legs on joints 7 and 10 are black outwardly. Venter pale whitish throughout. During this stage the larva eats only the lower half of the leaf.

Second stage.—Head slightly bilobed, flat in front, pale whitish, more distinctly white in a large patch covering the clypeus. A broad diffuse red-brown band runs to the vertex of each lobe. Ocelli black; width of head .7 mm. Cervical horns short, black, arising from swollen bases and each tipped by a short hair; stemapods 1.2 mm. long, pale yellowish, with a few black dots near the center, the terminal extensile portion crimson preceded by a black ring. Body pale greenish, not shiny; joints 2, 7, 11 and 13 red-brown above as are the feet on joints 7 and 10. A broad irregular brown dorsal shade and four fine red-brown lateral lines

somewhat indistinct on joints 8—10. As the stage advances all the red-brown fades out except on the cervical shield; the dorsal shade becomes a band, contracted at the segmental sutures and enlarged on joints 7 and 11. During this stage and subsequently the larva eats the whole leaf.

Third stage.—Head slightly bilobed, flat in front, rounded and narrowing a little to the vertex; pale whitish green, a broad diffuse brown band on each lobe from the ocelli to vertex; ocelli black; width 1.35 mm. Cervical horns are two short black tubercles on the cervical shield; stemapods 2 mm. long, faintly reddish with a few elevated black dots, especially below and outside. the tips a little swollen and crimson. Body whitish with three fine faint white lines on each side of the reddish brown dorsal band which is very distinct, covering the cervical shield and anal plate, retracted at each suture and widening on joints 7 and 11 more than on the other segments. Feet and venter concolorous with the body. As the stage advances the body becomes green, the bands on the head and the dorsal band of the body become edged with white and the two remaining narrow undulated subdorsal lines, pale yellow.

Fourth stage.—Head not distinctly bilobed, about as high as wide, flat in front and narrowing toward the vertex; width 2.1 mm; marked as before, the inner white border of the brown bands very broad, covering nearly all of the front of the head except the clypeus and central suture; antennae and mouth parts whitish; maxillae black inwardly. Cervical horns reduced to mere points; stemapods 2.5 mm. long, whitish, shaded with red-brown at the bases and ends, the few minutely piliferous elevated dots brown, and the extensile part white. Body marked

as before; the dorsal band of nearly uniform width, retracted at the sutures, hardly distinctly wider on joint 7, considerably widened on joint 11, expanded on joint 2 to cover the rudimentary horns and faint on the anal plate. Length after molt, 15 mm. As the stage advances the broad inner borders of the bands on the head fade out near the bands leaving a white line bordering the clypeus and central suture; the dorsal band becomes partly mottled with its white borders which are yellow at the sutures; there is a trace of a yellow stigmatal line and the sides have a few black specks at the extremities. Spiracles ocher, surrounded by yellow.

Fifth stage.—Head rounded, flat in front, pale green, the broad brown bands extending from before the ocelli to the vertex of each lobe slightly mottled and bordered behind with yellow and before faintly with white. A white line starts on each side of the clypeus a little above its base and borders it, running close to the central suture and becoming merged at the vertex in the borders of the brown bands; ocelli and maxillae inwardly black; mandibles and antennae white; width 3.2 mm. Body as before, cervical processes absent, stemapods relatively shorter (2 mm). Color green, a broad red-brown dorsal band mottled and streaked on a white ground, extended in two small distinct spots on joint 2 which represent the cervical "horns" and on joint 11 containing a V-shaped brown line which is repeated more faintly on joint 12. The stemapods are white, brown inwardly and speckled with brown outwardly with a few minute hairs. In the segmental sutures the dorsal band is slightly retracted and is yellow; a narrow yellow sub-dorsal line and a waved suprastigmatal line besides a stigmatal line on joints 3 and 4. Spiracles ocher, paler centrally and surrounded by a whitish

shade; a white subventral band on joints 11-13. Feet concolorous with body. A number of dark purple specks over the sides especially on joints 2-4 and 11-12. As the stage advances a marked change takes place. The head becomes finely reticulated with brown except on clypeus and mouth and the white marks become faint; the body except in the dorsal band and on the venter is heavily spotted with brown, the spots small but so thick that some become confluent. They tend to segregate in parallel longitudinal lines between the lateral yellow lines and are absent on the cervical shield and anal plate which are both large, the former semicircular. The color of the body fades to sordid greenish white and the brown of the dorsal band fades out leaving it creamy white with a fine brown line very near each edge, brown intersegmental marks, a broad brown central streak on joint 7 and on the anal plate and the irregular V-shaped mark on joint 11. The spiracles are each surrounded by a brown ring. Length at maturity 50 mm.

Cocoon.—Formed between two leaves: semi-transparent, similar to that of *Schizura leptinoides* but less perfect and weaker.

Pupa.—Cylindrical, gently tapering to the extremities; thorax and wing cases moderately prominent; at the posterior edge of the thorax, a curved row of rounded cutical granulations. Cases densely creased, body more sparsely punctured. The cremaster consists of two separate, short, conical projections, their sharp ends curved almost straight outward, above which is a curved row of about a dozen narrow carinated ridges 0.5 mm. long, parallel to the length of the body. Length 20 mm; width 7 mm.

Food plant.—Sycamore (*Acer pseudo-platanus*).

Larva from Dutchess Co., New York.

THE EMBRYOLOGY OF A COMMON FLY.*

Since 1886 five investigators, Kowalevsky, Blochmann, Bütschli, Henking, and Voeltzkow have contributed important observations on portions of the embryology of common muscids (*Calliphora*, *Lucilia*). To this list Prof. Graber's work is now to be added as the most comprehensive and voluminous. This paper is worthy of special attention, coming as it does from an eminent entomologist who has for years been actively productive in a field which many a younger investigator has deserted after contributing a short memoir on some common insect.

Prof. Graber's treatise covers nearly the whole ground of embryonic development in *Musca* beginning with the cleavage of the egg and concluding with a description of the nervous system and the formation of the imaginal discs. To our knowledge of the preblastodermic stages he cannot be said to have added any really important facts, although he has succeeded in correcting some of Voeltzkow's errors.

The formation and evolution of the germ-layers of *Musca* constitutes the all-important topic of the paper. After devoting a preliminary chapter to some observations on *Aphis*, in order to disprove Will's statement that the mid-gut arises from the yolk-cells (vitellophags), Prof. Graber attacks the subject in *Lucilia* and *Calliphora*, pointing out step by step as he proceeds the points wherein he agrees or disagrees with his predecessors. The main question: Do the vitellophags take part in the formation of the mid-gut? was answered negatively by Kowalevsky, Bütschli and Voeltzkow and to this conclusion Prof. Graber assents. In this important point he

cannot be said to have made any great advance, his observations being merely corroborative of the results obtained by other recent investigators besides those who have worked on *Musca*. The fatiguing length to which Prof. Graber goes in describing his sections would be unpardonable, were it not that he had not read Heider's work on *Hydrophilus* or his present critic's paper on *Doryphora* before publishing.

To the important subject of the relations of the fore- and hind-gut to the blastopore Prof. Graber has contributed some interesting observations, although his remarks, as we hope to show presently, must be received with some reservations. His results are very briefly these: The fore-gut (stomodaeum) is formed near the anterior end of the gastrula raphe as a distinctly ectodermic invagination whereas, on the other hand, the hind-gut (proctodaeum) appears to be formed as a deepening of the gastrular groove at the posterior end of the embryo. Its walls are consequently of mesentodermic origin. Besides the elongate median gastrula, familiar to all students of insect embryology, Prof. Graber describes two pairs of grooves which run parallel with the median groove and also contribute in the formation of the mesentodermic layer. These grooves thus constitute a lateral gastrulation. Their relations to one another and to the median groove are not easily understood from the description and Prof. Graber should have introduced diagrams to show their exact position and extent. The true morphological significance of the lateral gastrulation is not explained and as nothing comparable to it has been observed in other insects, the observation has as yet only the value of an interesting and isolated fact. The author's suggestion that the small grooves may be a new formation introduced for the purpose of augmenting the mesentoderm is, to say the least, improbable, when

*Vergleichende studien über die embryologie der insecten und insbesondere der musciden. Von Velt Graber. Denkschr. d. math. naturw. classe d. k. akad. d. wiss. Wien, bd. 56. 1889. (4to. p. 257-314. 10 plates.)

we take into consideration the great extent of the median invagination in *Musca* and the small size of the blastopore in certain *Orthoptera* where no lateral gastrulation has been observed.

One may venture to object to some of the new terms of which Prof. Graber has been rather prodigal in his latest papers. The time-honored term "blastoderm" is easily understood and it is difficult to see why it should be relegated to the biological attic for effete nomenclature to make room for an only remotely suggestive term like "cycloblast." Prof. Graber now dubs the yolk-cells "centroblasts" notwithstanding the termination "blast" is properly applied only to tissues of a germinal or formative character and not to elements which, like the yolk-cells, degenerate and take no part in building up the insect. It would be wiser to suspend the use of terms like "ptychoblast" till we possess a better knowledge of "arthropod" germ-layers, as we have still a great deal to learn on this subject. In the meantime "mesentoderm" is quite clear and will answer all purposes. "Entomyoderm" and "ectomyoderm" are scarcely to be regarded as improvements on the old terms, "splanchopleure" and "somatopleure." We supposed that Prof. Graber's terminological fecundity was exhausted when he gave us the sesquipedalian, "ectoptygmatoregmagenous ptychonotogony." But these are small blemishes in a work which will rank among the more important contributions to insect embryology.

The chief value of Prof. Graber's paper cannot be said to lie in a furthering of what we must regard as one of the chief aims of the study of insect development, viz: a knowledge of the mutual phylogenetic relations of the existing orders of insects (often separated by wide gaps, towards the bridging of which comparative anatomy and paleontology have contributed only a little), and a knowledge of the relations of insects, as a class, to other arthropod groups and to their remote ancestors, the annelids. In our estimation Prof.

Graber's work is chiefly valuable as showing to what an extent the embryonic development of a calyptrate muscid has been deflected from the ancestral path—in other words, it is an admirable picture of one of the "short-cuts" in insect development.

It will be remembered that the egg of the fly hurries through its whole development in about 24 hours, that it is provided with a relatively small quantity of yolk, and that the characters of the secondarily developed and degraded maggot have been reflected back into embryonic life. That this reflection has materially altered the original ontogeny as displayed by older forms such as the *Orthoptera* and *Hemiptera*, is evident from the fact that the embryo no longer exhibits the typical cephalic and thoracic appendages, to say nothing of the abdominal appendages (embryos of bees, beetles with apod larvae and fleas still develop thoracic legs!). Moreover the amnion and serosa are rudimentary in *Musca*; the head has become profoundly and strangely modified and the mesodermic layer no longer exhibits the typical paired coelomic cavities. It is, therefore, obvious that conclusions drawn from the embryogeny of a muscid cannot without extreme caution be extended to cover other insects. It is further evident that to ascertain the exact path of development in an insect that develops so rapidly a very great number of eggs must be examined to insure certainty in regard to the different steps in the hurried sequence of tissue-changes. Granting the correctness of Prof. Graber's observation that the proctodaeum is of mesodermic origin, we may perhaps account for this condition on the supposition that whereas in other insects of slow development the hind gut is not formed till after the closure of the posterior end of the blastopore, in *Musca* the processes of growth succeed one another so rapidly that the blastopore does not have time to close before the hind-gut is found. Thus the apparently mesodermic character of the hind gut would

be a secondary condition due to acceleration of development.

The 10 plates with 127 figures illustrating Prof. Graber's papers are beautifully executed and are by far the most accurate ever published on the subject. It is to be regretted that Prof. Graber did not introduce larger, clearer and more numerous diagrams. The need of these is especially urgent as it is next to impossible to obtain good surface views

of the fly's egg, and mental reconstruction, even from such excellent sections as those given in the plates, is no easy task for the reader.

It is to be hoped that the next investigator who undertakes the study of the *Musca* egg will make use of the wax reconstruction methods now so successfully employed by workers in other fields of embryology.

W. M. WHEELER.

OENEIS AND ITS EARLY STAGES.

At the last (May) meeting of the Cambridge entomological club Mr. S. H. Scudder spoke of the group of *Oeneides* as one of the most interesting of butterfly genera, partly because (using the word in a restricted sense) there was no other genus of butterflies in which so many species were common to the Old and New Worlds, but more because it is the only genus entirely restricted to high latitudes and altitudes and widely spread in the world. Eight species occurred in Europe-Asia, of which two or three were also found in North America, which possessed besides at least eight or nine species. One would suppose that it would be one of the last with the early stages of whose life we should be acquainted, and this was the case until recently, but now more or less has been published concerning eight of the species, mostly from observations in this country, and it is understood that Mr. W. H. Edwards, to whom most of this advance is due, has full or tolerably complete histories of two or three more.

I had the good fortune, he remarked, to be the first to publish an account of the early stages of one of the species of the genus—*Oeneis semidea*, the only one found in New England,—due to the joint efforts of the late Messrs. Shurtleff and Sanborn and myself, though no one has yet carried the creature through from the egg. Since then most of

the additions to our knowledge of American species have come from Edwards, but Fyles has published the history of *Oe. jutta* to which Fletcher and I have added something, and in Europe, where the same species occurs, Holmgren and Berg. One of the latest known species, *Oe. macounii*, is now almost completely known, thanks to Mr. J. Fletcher, who has published an account of it, and the egg and first larval stage have also been described by Mr. W. Beutenmüller. All that is known of *chryxus*, *iduna*, and *ivalda*, is due entirely to the indefatigable efforts of Mr. Edwards.

Of the European species also, it so chanced that I was the first to publish anything (a year previous to Berg's account of *Oe. jutta*) describing the egg and first larval stage of *Oe. aello*, the alpine species, to which nothing has since been added; and excepting *Oe. jutta*, before referred to, the early stages of only one other species, *Oe. bore*, are known, due to the studies of Sandberg.

Out of sixteen or seventeen species, then, recognized in the northern hemisphere, we now know more or less of the transformations of about half the species not to mention the two or three which Edwards has worked out but not yet published. This is a remarkable showing for a group of butterflies with such a distribution, and brings out several features which are a little puzzling. First, there are two types of surface sculpture in the eggs; the more common is that in

which the more or less sinuous or zigzag ribs form with their interspaces laterally alternating, very similar and equal, angulate elevations and depressions over the sides of the egg; in the other the elevations are more abrupt and rounded and are separated from each other by nearly flat interspaces. The latter type is represented by aello, and, to judge from advance copies of one of his next plates Mr. Edwards has kindly shown me, to a more marked degree by one of the species whose transformations are yet unpublished; the other type includes semidea, jutta, ivalda, iduna, chryxus, and macounii. Second, there are two types of structure in the caterpillars just from the egg, but these two types in no way correspond with those found in the egg. In one, the terminal segment has the two posterior forks produced to more or less blunt points and the notch between them is deep; in the other, these forks are rather broadly truncate and the notch between them slight. To the latter belongs only *Oe. semidea*; to the former, jutta, ivalda, chryxus, macounii, and aello, as well as the unpublished form referred to.

The chrysalids, as might be expected with concealed objects, show little difference, but in the imago a wide diversity exists, especially in the form of the wings and their markings and in the presence or absence of a discal streak upon the upper surface of the fore wings of the male. But it would appear that any division upon these grounds would more or less cut athwart the groups derived from the egg or the juvenile larva, unless it be that the more rounded and less pointed fore wing combined with a lack of ocelli and of sexual adornment and the possession of more densely and profusely haired mid and hind femora in the imago is correlated with the truncate tips of the forks of the last segment in the juvenile larva; in which case the first larval stage of bore and brucei as well as of oeno should, like semidea, show a truncate extremity. Sandberg has described (but insufficiently) the young larva of bore,

and Edwards has raised but not published brucei, so that we shall doubtless soon be able to know whether this is true; if so, it might be well to divide the genus into two groups, to which the subgeneric names of Oeneis and Chionobas might then be given, the former to the latter group, the latter to that of which *Oe. semidea* would be typical.

NOTES.—The second and somewhat tardy part of Lowne's anatomy etc. of the blow fly (London, Porter) is even more extended than the first, containing 116 pages and 6 plates besides 17 figures in the text, all the illustrations being very coarse but instructive wood cuts. The part is entirely devoted to the "integumental skeleton of the imago" and is so detailed and so full of comparisons that it almost serves the purpose of a general treatise on entomology. Half a dozen topical bibliographies scattered through the work will be found very useful.

The death is reported of M. Jules Künckel d'Herculais, formerly president of the French entomological society, while carrying on official researches upon the destructive locusts of Algeria. The sensational reports of the press that he was overcome and devoured by locusts is in no way to be credited. The probable truth is that he was overcome by the heat of the desert and died before his body was found, the locusts devouring a portion of his clothing. His superb quarto volume, still incomplete, upon the genus *Volucella*, with its 26 exquisite plates, is practically a treatise on the anatomy of the Diptera and will remain a monument to his technical skill as anatomist and delineator.

Concerning the distribution of *Vanessa cardui*, Mr. Charles Oberthür, in commenting at the April meeting of the French entomological society on Scudder's doubt (Butt. N. E., 478) whether the species is indigenous in French Guiana and in Tahiti, says that as Boisduval neglected to attach any labels to his exotic specimens of this species (excepting one from Madagascar) it is impossible to

say whether his collection, now owned by Oberthür, contains any specimen from either country; but he possesses specimens from French Guiana collected by Constant Bar at Isle Portal on the Maroni, the river which separates French and Dutch Guiana. He gives a list of other localities from which he possesses specimens, but none of them are of special importance.

PROCEEDINGS OF SOCIETIES.

CAMBRIDGE ENTOMOLOGICAL CLUB.

8 MARCH 1889.—The 144th meeting was held at 156 Brattle St., the president in the chair.

Dr. H. A. Hagen said that the cyclamens in a greenhouse in Montvale, Mass., had been injured by *Otiorkynchus sulcatus*, and remarked on the history of our knowledge of its depredations in America.

Mr. S. Henshaw stated that it had recently been introduced into New Zealand where it is also doing much damage.

Mr. H. Hinkley showed a variety of *Saturnia io* in which the eye-spot on the hind wing is almond-shaped. He has raised a large number and showed a fairly large series which exhibited some very pretty gradations of color.

Mr. S. H. Scudder remarked on the former range of distribution of *Pieris oleracea*. He gave as a reason why *P. rapae* has exterminated *P. oleracea* that the first brood of the former hatches about two weeks earlier than that of the latter species.

Mr. Scudder then read a paper on cosmopolitan butterflies.

Dr. H. A. Hagen remarked briefly on the distribution of certain dragon-flies in Brazil, showing that many are extremely local.

Mr. J. H. Emerton showed drawings of the copulatory organs of *Agalena naevia*. The palpal organs are, with few exceptions, of three varieties, the most common variety having a stout spiral tube of one and a half

turns with the tip turned outward. Another variety found only in large individuals has the tube longer and more slender, and a third variety found in spiders of various sizes, has the tube very short and coiled in a small spiral. The epigynum is of two principal forms; one with a simple opening, and the other, usually occurring in large spiders, with a wide opening partly divided into two by a process from the front edge; between these are many intermediate forms. The other parts of the male palpi vary but little and there are no other variations which would show that we have more than one species of these spiders.

Mr. Emerton stated that he had found a new species of spider in the natural history society building in Boston. There were two specimens, one male and one female. They may be foreign as they were found near some West Indian material that had been there for about two years.

[The records of several meetings at this point have been lost.]

11 October, 1889.—The 148th meeting of the Club was held at 156 Brattle St., the president in the chair.

The secretary stated that the records of the last meeting had been mislaid.

Mr. S. H. Scudder gave an account of what had been done at the meeting of the Executive Committee, and showed the circular which was sent soliciting subscriptions to Psyche.

Mr. Scudder then gave a brief account of his field work in the west during the past summer for the U. S. Geological Survey. Having first visited Florissant in order to make sure of bringing home a sufficient number of fossil insects to warrant the outlay of the expedition, he next went to western Colorado to examine two localities near together. One of them on the summit of the Roan Mountains, on the divide between the White and Grand Rivers, where fossil plants of species identical with those found at Florissant had been obtained many years ago,

and the other in the lower White River, where at two different localities forty miles apart Denton had many years ago brought home a small collection of fossil insects of presumably the same age as those at Florissant. In both of these places the party was very successful. The journey had to be made in a wagon and the search among the rocks on foot or on horseback, and as the greater part of the time had to be given up to the attempt to discover which beds contained fossil insects, very little was left for the exploitation of the same; for the beds in which insects were found covered an area of hundreds of square miles, and in a vertical series ranging from five hundred to fifteen hundred feet, in nearly all of which some remains were found but in certain localities, especially at the extreme upper beds, in such abundance as to warrant the belief that each of these localities may be richer than that of Florissant, hitherto believed to be the richest in the world. Subsequent visits were made to Green River, Wyo., where the pocket in which all specimens had hitherto been found had been entirely worked away, and his efforts were directed to the discovery of some new location in the immediate vicinity; in this he was successful, and was able to obtain several hundred specimens; at Fossil in the same territory, insects were found to occur so rarely as not to warrant a search for them, and at Amethyst Mt., in the Yellowstone Park, no strata sufficiently fine in which to preserve the remains of fossil insects were found in those beds which have yielded the leaves of plants.

Mr. Scudder then showed specimens of some of the fossil Diptera brought from Colorado. He said that the same species of larvae had been found throughout five hundred vertical feet of strata.

Dr. H. A. Hagen remarked on Dr. Packard's article in *Psyche* on the epipharynx of insects which he considers very important. He said that European white ants had been introduced into Panama.

Mr. S. H. Scudder remarked on the scarcity

of butterflies and in fact of all insects in the Yellowstone Park, and indeed throughout all the west during the past summer.

Mr. H. Hinkley said that he had investigated whether the milk-weed butterfly hibernates or not and came to the conclusion that it does not.

Mr. Scudder said that he had found it very difficult to make butterflies which hibernate in nature do so in confinement, so that he does not place much faith in negative evidence from artificial experimentation.

Mr. Hinkley said that a fungus disease very like muscardine has attacked the larvae of *A. promethea* during the past summer. He said that he had raised a true second brood of this species, and had reared large numbers of other Bombycidae in close proximity to his prometheas and none were affected.

8 NOVEMBER, 1889.—The 149th meeting of the Club was held at 156 Brattle St., the president in the chair.

Dr. H. A. Hagen in commenting upon an article on the gipsy moth (*Ocneria dispar*) in the Boston Transcript for 31 October, 1889, said that he remembered the fact of the accidental introduction of the species by Mr. L. Trouvelot some twenty years ago. Judging from his experience with the species in Europe, Dr. Hagen doubted the necessity for legislative acts and appropriations in order to suppress its ravages.

Mr. S. H. Scudder exhibited a fossil trilobite which showed a remarkable resemblance to a scarabaeid-beetle (*Phanaeus*), also a new species of fossil butterfly (*Barbarothoe florissanti*) from Florissant, Col. This butterfly is the second of the Libytheinae found at Florissant, and is most closely related to the European species; the other (*Prolibythea vagabunda*) is most nearly allied to the species from West Africa. Of the known fossil butterflies one ninth are Libytheinae; of living species one eight-hundredth belong to the same family.

Mr. Scudder also exhibited a photograph of a suffused melanic male of *Papilio turnus* sent by Mr. James Fletcher of Ottawa.

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PSYCHE.

ON A SINGULAR GLAND POSSESSED BY THE MALE HADENOECUS SUBTERRANEUS.

BY H. GARMAN, LEXINGTON, KY.

The male of this cricket is found at times with a pair of white, fleshy appendages protruding from slits between the terga of the 9th and 10th abdominal somites, the nature of which is not clear, and about which I find nothing written in the literature relating to the species, to which I have access.

The slits through which the organs appear are situated one on each side anterior to and a little within the cerci. When fully protruded the glands are white, cylindrical, a little tapering, and are about 1-8 inch long. They are not protruded by the young, as far as observed, but the slits, which are of rather large size, can be made out in them without difficulty. I believe they are protruded during the period of sexual excitement. A number of examples were taken *in copula* with the lot in which individuals with protruded glands occurred, but unfortunately were not noticed with reference to the glands at the time of collecting. They appear to have no immediate connection with genital organs.

What their function may be can only be conjectured at present. Scent glands somewhat like them have been observed

in some female moths of the family Bombycidae. If the organs are scent glands, however, it is a little strange that they should be borne by the males. I can imagine no other use for them. The sense of smell is certainly the one best calculated to bring the sexes together in the darkness of the caves. Auditory organs such as occur in Locustidae and Acrididae they do not possess, and the tactile sense, though highly developed, is manifestly inadequate to all demands of the peculiar surroundings.

As organs possibly of the same nature, I may mention that Miall and Denny refer to glands of unknown function which are protruded in the pleural region of the abdomen in *Corydia carunculigera*, one of the Blattidae.

Prof. A. S. Packard figures on pl. 17, fig. 3, of his work on cave animals, a male cricket which is said by him to be infested with a parasitic fungus. There is some probability that this supposed fungus is one of these glands.

The figure represents the tip of the abdomen of the male cricket, seen from the side, and with the somites drawn apart more than is natural. 7, 8, 9, somites; *a*, gland, partly protruded; *b*, fully protruded gland.



A NEW SIMULIUM FROM SOUTHERN NEW MEXICO.

BY C. H. TYLER TOWNSEND, LAS CRUCES, N. M.

In the southern part of New Mexico, along the valley of the Rio Grande, there begins to appear about the first of May a buffalo gnat which is quite as troublesome, especially to man, as its more eastern congener, *S. pecuarum*. It proves to be an undescribed species. The first individuals that I have noticed this year were in an orchard near Mesilla on the 7th of May, and they were at that date swarming in considerable numbers. Mesilla is about a mile from the Rio Grande, which flows to the west of the town. Gnats were found also on same date but in less numbers on the college grounds, which are situated about four miles from the river. The river rises in May, overflows all the low areas lying adjacent to it, and becomes a roaring, rushing body of water. Its volume is dependent on the amount of snow in the foot-hills to the north particularly in Colorado, and on rains, which are only exceptionally a factor. The snow in the cañons exerts little influence, for its thaw is so gradual as not to be felt. I give these data for what bearing they may have on the breeding habits of this species. It is well known that *Simulium* breeds in running water, and our species no doubt is dependent on the rise of the Rio Grande for its appearance. Doubtless, also, it is distributed through the valley by the

system of acequias or irrigation ditches in use in this country, which open from the river on a higher level to the north, and furnish the only source of water supply for the raising of crops. This is an adverse bearing of the question of riparian irrigation on injurious insects. The securing of artesian water and shutting off of the river water would no doubt lessen the dispersion of the gnats through the valley.

From the first part of May the gnats increase in numbers, until by the middle or last of that month they are very abundant in all parts of the valley. It is usually between this time and the middle of June that the river is at its highest point. They are then to be found on the mesa to the east toward the Organ Mts., and may be met with also on the elevated mesa nearer the mountains, especially to the north. On May 17th I observed them on the summit of the first mountain at the eastern end of the Doña Ana range, which is nearer the river than the Organs, and farther north. The elevation is at least 4,500 (probably 5,000) ft. above sea level, or about 1,500 (perhaps 2,000) ft. above the level of the river. They are not found in the Organ Mts., which are about twenty miles east of the river, nor on the plains to the east and south of them, though on the mesa to the

west they approach to within a few miles. This was observed May 23d-24th, while in the valley itself at this time they were almost unbearable.

These gnats are a great annoyance to man, by far greater than any other insect that we have in this locality. Many persons are so susceptible to them as to preserve through the height of the gnat season a chronic inflammation of the exposed parts of the face and neck resulting from repeated bites, which cause an intense irritation and even give rise to cutaneous sores. The inclination of the gnats to bite increases with the advance of the season, but the pest is considerably abated after the fall of the water. They are also very troublesome to animals, and are supposed to cause the inflamed eyes in the horses of this region through the summer months. I append a description of the species. The female alone is described, as that is the only sex which composes the biting swarms, and I have not secured either the male or the early stages.

Simulium occidentale, n. sp. ♀. Cinereous, abdomen light fulvous. Head cinereous, eyes black; face cinereous, raised, somewhat darker in the centre, sparsely clothed with fine silvery hairs; front cinereous, widened below into a cross-bar, a prong invading the orbital area on each side, silvery pubescent on the orbital margin, and with longer pubescence on the occipital margin; proboscis black, brownish at tip, palpi black; antennae cinere-

ous, with short, silvery pubescence, the two basal joints longer than the following joints, which are nearly equal in length; occiput cinereous, with silvery pubescence around the margin. Thorax cinereous, mesoscutum entirely covered with silvery pubescence, with two dorsal lines, and usually a fainter median line between them; pleurae fulvous posteriorly; scutellum black, silvery pubescent. Abdomen light fulvous, sparsely covered with short silvery pubescence; second, third and fourth segments above with a brown cross-band shading to darker on the sides and in the middle, particularly on the third and fourth segments; remaining segments with a broad, median, dorsal, cinereous band, bounded laterally on the fifth, sixth and seventh segments by a curved, more or less faint line of brown; venter light fulvous, silvery pubescent. Legs black, silvery pubescent. Wings hyaline, iridescent by reflected lights; halteres white. Length of body 2 mm; of wing 2 mm.

Described from many fresh specimens.

This species is smaller than either *S. pecuarum* or *S. meridionale*. *S. metallicum* Bell. from Mexico is given as 2 mm. long, but it is the male which is described, and the female would be very much larger. *S. occidentale* differs from *S. pecuarum* very markedly in the thoracic and abdominal markings. These markings are very much like those of *S. meridionale*; but the median thoracic line is always very faint, the abdomen is light fulvous, the lateral lines of segments 5, 6 and 7 are curved, and the abdominal markings are of a different color, besides other minor differences.

TWO NEW LEPIDOPTEROUS BORERS.

BY OTTO LUGOER, ST. ANTHONY PARK, MINN.

To the long list of injurious borers infesting cultivated and wild plants two new species must be added which, in Minnesota, are of especial interest, as they cause great damage to some of our trees, and even threaten to destroy them entirely in some regions.

All visitors to the Twin Cities admire our groves of oaks, chiefly composed of peculiarly branched and gnarled burr-oaks, and dark and straight red-oaks. The former, though badly infested by numerous species of insects, seems to be proof against any lasting injury by them. The tree is in fact so well protected with a corky bark, even found upon the youngest twigs, that both insects and intense cold seem to be powerless. This is quite different, however, with our red-oak, a tree of much quicker growth and but slightly protected by thin and glossy dark bark, at least when still young and not wrinkled by old age. Nature seems to have endowed the former, like a good mother, with a warm and enduring coat against insects and the inclemencies of winter, and to have treated the red-oak like the step-mother so much fabled about. The red-oak seems to have a very great attraction for all kinds of boring insects, but notwithstanding its wonderful power to repair injuries and to heal wounds made upon its bark and wood — a power not shared by the burr-oak — the tree is a doomed one, provid-

ing no steps are taken to protect it as well as it deserves. But all advice to protect any of our native trees is usually received with a smile that is more or less unpleasant to the true lover of nature, as it contains the elements of contempt, ridicule and derision for the adviser.

Among the worst borers of the red-oak are several lepidopterous larvae, but chiefly those of *Prionoxystus querciperda* (Fitch), *P. robiniae* (Peck) and *Trochilium luggeri*. The first (pl. 3, figs. 1 and 2), as well as the second species, are insects described long ago; the latter, and the most injurious one in this region, has been described by H. Edwards, our authority in this family of insects. Below is his description, illustrated by pl. 3, fig. 3.

Trochilium luggeri n. sp. Upper side of head black, orbits of eyes bright lemon yellow. Face black. Palpi black at the base, otherwise lemon yellow. Thorax with the disk black, with short erect downy hairs. Collar, patagia, spot at the base of the wings, and a broad streak at base of thorax conspicuously lemon-yellow. Antennae chestnut brown above, dull orange beneath. Tibiae orange, tarsi somewhat of a darker shade. Abdomen black, anal tuft pale orange, with bright yellow band at the posterior edge of all segments, those of the posterior segments much widened. Forewings thinly clothed with scales the costa narrowly dull orange as is also the oblique rather indistinct discal mark at the end of the cell. The space from vein 2 to vein 5 clear of scales behind the cell. Hind



1



2



3



4

wings with the anterior margin dull orange. Fringe of both wings brownish. Under side of forewings with the costa lemon-yellow. Length of body 20 mm. Exp. of wings 35 mm.

The moth issues towards the end of May, and fresh pupal skins can be observed till towards the close of June. Some trees harbor hundreds of these insects, and consequently suffer greatly; the trunk and all the larger limbs are equally infested. In only one instance a pupal case was seen projecting from the trunk of a small burr oak.

A second and equally injurious borer is destroying our ash-trees in the wind-breaks surrounding farm houses located in the open prairies, and also those planted in the parks or as shade trees along the streets in our villages. As a general rule only the smaller trees are infested, but these to such an extent that they break down entirely. Professors Aldrich and Orcutt have given the life-history of this insect in a late bulletin. But even old and very large trees do not escape entirely, as I have seen trees two feet in diameter, and apparently quite healthy, whose bark was perforated with numerous holes made by this insect. In these cases the trees did not suffer to any visible extent, but death is always the consequence in smaller trees where the borer cuts off entirely the circulation of sap, and enters deeper into the solid wood.

Trochilium fraxini, n. sp. The head is grizzled black above, with the base, palpi and antennae dark orange. Coxae black, tibiae and tarsi orange, the posterior portion of the tibiae broadly banded with black. Thorax with the disk black, with rather long and

erect black hairs. Collar, patagia, a large spot at the base of each wing, and a narrow streak over the posterior part of scutellum lemon-yellow; all these spots with the exception of those at base of wings are edged in front with dark orange. Abdomen black, banded with yellow at the posterior end of each segment; sides of posterior 5 segments orange, the orange extending almost over the whole surface of the three last ones.

Forewings covered with scales, except a narrow portion from base to cell, and some very small spaces immediately behind the cell. Costa and internal margin coppery brown. Outer margin broadly brown, shaded with purplish copper. Discal mark large, almost rounded. At the base all the veins are stained with bright scarlet orange, and there are some scales of the same color below the costa. Beneath the forewings are lemon-color on the costa, shading into orange towards the centre of the wing, and into brown on the outer margin. Discal mark orange. Hind wings with a coppery sheen. Fringes of both wings brown. Length of body 15 mm. Exp. of wings 30 mm.

In pl. 3, fig. 4, this species is shown; it resembles very strongly a *Polistes*.

This species resembles very closely the injurious moth *Podosesia syringae* (Harr.), but belongs to a different genus.

EXPLANATION OF PLATE 3.

Fig. 1. *Prionoxystus querciperda*, ♂ and ♀ imago, and empty pupal case; natural size.

Fig. 2. The same. larva; natural size.

Fig. 3. *Trochilium luggeri*, imago, empty pupal case and hinder extremity; the last enlarged, the others of natural size.

Fig. 4. *Trochilium fraxini*, imago; natural size.

NOTES ON BOMBYCID LARVAE.—I.

BY HARRISON G. DYAR, NEW YORK, N. Y.

NOLA OVILLA Grote.

1875. Grote, Can. ent., 7, 221.

1884. Packard, Amer. nat., 18, 726.

Larva. Dr. Packard makes the following statements: "It differs from Arctian and Lithosian larvae in having one less pair of abdominal legs. The body is broad and much flattened, rather short, with four pairs of well developed abdominal feet; the first pair being situated on the fourth abdominal segment. The body is hairy, though not densely so; on each segment are four dorsal tubercles, from which radiate short dusky hairs; on the side is a larger and longer tubercle from which arise lateral, very long hairs. Length 13 mm."

Cocoon. "Boat-shaped, flattened, oval cylindrical, closely attached to the surface of a leaf. It is composed of silk, covered closely on the inside with bits of oak leaves."

*NOLA TRINOTATA Walker.*1866. Walk., Cat. Brit. mus., pt. 35, pg. 1902, *Lebena*.1891. Butler, Insect life, v. 3, p. 297, *sexmuculata* Grote.1877. Grote, Can. ent., v. 9, p. 235. *Nola*.

1890. Dyar, Insect life, v. 3, p. 61.

Larva. I have elsewhere described this larva. It is a thick, somewhat flattened insect, the last segment small, the abdominal feet consisting of but four pairs, as in the preceding. It is furnished with piliferous warts as above. It lives exposed upon the surface of the leaves, forming no web.

Cocoon. Curiously constructed of little pieces of bark laid together like bricks. It is interesting to watch the larva forming cocoon, which it does by building up parallel walls by spinning the little plates of outer bark together by their edges, and

sequently drawing them together from the inside. The pieces of bark are bitten off the branch on which it forms its cocoon.

NOLA HYEMALIS Stretch.

1885. Stretch, Ent. amer., 1, 102.

Larva. Congeneric with the above. Body flattened, wider than high, tapering very slightly to the extremities; abdominal feet present only on the 4th, 5th, 6th and 10th abdominal segments. Head small, pale testaceous, whitish above the mouth with brownish marks at the sides; ocelli black. Body pinkish, cervical shield bisected, dark; three rows of piliferous warts on each side as in *N. sexmuculata*. The upper two are brownish and bear short hairs; the third row (lateral) is orange, and bears long, whitish hairs. On the body is an interrupted dorsal and waved subdorsal line, and brown dorsal shades connected with the lines; spiracles black; length of larva 10 mm.

Cocoon. Not strong, composed entirely of silk, and not firmly fastened to a support. It is elliptical, opaque white. The pupa is without cremaster, light brown, and pilose.

I found a number of these larvae on willow near Phoenix, Arizona, in November, 1885.

NOLA BORGHIELLA Riley.

1882. Riley, Report U. S. Dep. Agr., 187, pl. 11.

Larva. This is congeneric with *cedina* species. It may be seen on the leaves of the same plant as *Ri*.

It is characterized by its habit, as it differs from *Nola* in that it does not spin a web. The cocoon of *Nola* is of a different shape and the larvae are of a different color.



Seventh stage (♀ larvae only). Head pale yellow minutely mottled with grayish spots; labrum, antennae and a spot before the eyes, white; ocelli and jaws black; width 3.5 mm. The body is as in the previous stage, but the warts on the cervical shield are not distinctly darker. The dorsal blackish or pale gray shade is in triplicate on joints 3 and 4. Spiracles white in a fine black border. The body is often bright yellow, as are the dorsal tufts, and even the hair is yellowish.

Cocoon. Double, thin, made of silk and the hairs of the larva.

♂ *Pupa.* Cylindrical, the abdominal segments tapering, the eyes, wing cases and antenna cases especially prominent; a little depressed behind the thorax. Semi-transparent, shiny yellowish white, the back covered with long, thin, silky white hairs; cremaster flat, terminating in several brown hooks well fastened in the silk of the cocoon. Length 12 mm.; width 5 mm.

♀ *Pupa.* Robust, thickest through the

2nd to 4th abdominal segments, elsewhere smaller, of nearly even width; thorax and head small, no wing cases, leg cases small. Last segment rounded, cremaster flat, rather broad at base, terminating in a number of brown divergent hooks. Color semitransparent, shiny, very pale yellowish, without marks. Over the dorsum considerable fine, rather long, whitish silky hair. Length 18 mm.. greatest diameter 8 mm.

♀ *Imago.* Of the same structure as *O. leucostigma*, but not white, the color of the down, which is especially abundant on the ventral side, being light brown. A small black spot on the second abdominal segment. The rudimentary wings are dark cinereous. The ♂ imago is very similar to *O. leucostigma*, but can be distinguished by its darker color and heavier black markings.

Food plants. Dr Thaxter gives oak, but I have found the species as omnivorous as *O. leucostigma*. My specimens were fed mainly on maple and witch-hazel.

THE GERM-BAND OF INSECTS.*

Those who have watched the advance in our knowledge of insect embryology during the past three or four years will be deeply interested in Prof. Graber's latest treatise. Like his muscid paper it represents many years' study, but unlike that work it covers a very considerable ground, being a comprehensive description of the germ-band of a number of insects. The species investigated belong to the genera: *Lina*, *Lema*, *Telephorus*, *Melolontha*, *Hydrophilus*; *Pieris*, *Gastropacha*, *Bombyx*, *Zygaena*; *Hylotoma*; *Stenobothrus*, *Mantis*, and *Gryllotalpa*. It will be seen that this list comprises repre-

sentatives of four of the important orders. Prof. Graber treats of the formation and method of growth of the germ-band, its relations to the envelopes (amnion and serosa), its segmentation (both internal and external) and its appendages. Chapters are introduced on the formation of the germ-layers and on the origin of the body spaces. Many pages are given up to a minute and critical discussion of the results achieved by other investigators. The work concludes with a long chapter on the development of the nervous system.

In a brief sketch we cannot hope to do justice to the mass of matter with which Prof. Graber presents us; it will be possible to touch on only a few of the questions with which he attempts to deal. Before so doing

* Vergleichende studien am keimstreif der insecten, von Veit Graber. Denkschr. d. math. naturwiss. classe d. k. akad. d. wiss. Wien. Bd. 57, 1890, 621-734. 12 colored plates. 4°.

a word must be said about the technique employed by Prof. Graber. As he informs us, and as is quite evident from his twelve large colored plates, his results were largely obtained from germ bands isolated from the yolk, stained *in toto* with carmine, and mounted in some resinous medium. His first plate shows that he has also examined *Lina* embryos unstained and *in situ* on the yolk. Now both of these methods, though useful for some purposes, are quite inadequate to decide any delicate question concerning surface relief, and have consequently been all but abandoned by some recent workers. In point of detail Prof. Graber's surface views of *Lina* cannot stand comparison with some of the figures of insect embryos published decades ago, while nowhere is the inadequacy of his isolation method better shown than when he attempts to elucidate the structure of the brain. When represented at all in his figures this important organ is incorrectly represented. In order, therefore, properly to appreciate Prof. Graber's observations it is necessary to bear in mind that his technique is somewhat defective.

In the 15 quarto pages devoted to the nervous system there are many new and interesting facts, but we miss a careful treatment of the very earliest stages in the formation of the ganglia, both cephalic and ventral. It is safe to say that a few good sections through the nerve-cord of a sufficiently young *Stenobothrus* embryo would have brought out some interesting facts on the formation of the median and lateral cords—facts which would have induced the author to view the nervous system of the Coleoptera in a little different light.

A short time ago Prof. Graber devoted a paper to the important subject of metameric segmentation in insects. According to the observations therein recorded, the first segments to make their appearance in the embryo are not the definitive body-segments (*microsomites*), but segments nearly or quite corresponding to the imaginal aggregates of

segments (head, mouth-parts, thorax, abdomen); the definitive segments being formed by a splitting up of these *macrosomites*. Although it occurred to Prof. Graber at the time that this phenomenon might be due to a foreshadowing of adult structure, he chose to adopt the view that the early macrosomitic segmentation was an ancestral feature. In his present paper he devotes considerable space to this subject, bringing out quite an array of pseudo-mathematical formulae, and, notwithstanding Heider's very sensible comments on his former paper, still persists in seeing some mysterious palingenetic trait in macrosomitic segmentation instead of an anticipation of the ultimate adult structure. That the latter is the correct explanation is shown by a study of *Xiphidium*. In this Locustid the definitive segments make their appearance in a wave which runs from the anterior to the posterior end of the germ-band. When the whole postoral portion of the germ-band has thus been split up into about eight segments, the remainder of the definitive segments are successively intercalated just in front of the caudal plate. Then, and not till then, does macrosomitic segmentation set in. Although this method of growth by intercalation of segments in front of the anal plate has been repeatedly shown to be the typical method in Annelids, Crustacea, Peripatus, Arachnids, Myriopods and, to a certain extent, in *Hydrophilus* (Heider), Prof. Graber maintains that it does not occur in insects. Strangely enough the very figures of *Stenobothrus* to which he appeals, prove the very opposite of his contention, for they show quite clearly that the youngest segment must lie just in front of the anal plate. The first indications of segmentation have probably escaped Prof. Graber,—it being impossible, as we have found after repeated trials, to detect them in semi-transparent, isolated germ-bands.

Prof. Graber divides insect embryos into microblastic and macroblastic, or long and short ones. *Stenobothrus* is microblastic;

Lina macroblastic. Apart from its being unscientific to classify things as big and little, it is difficult to understand how such a classification can be of any service whatsoever. There is a complete gradation between long and short germ-bands: in *Stenobothrus* the germ-band is very small when first outlined on the yolk; in *Mantis* and *Oecanthus* it is somewhat larger; in *Gryllus* still larger; in *Blatta* it is nearly as long as the egg; in other forms, like *Musca* and the *Coleoptera*, it is longer than the egg. But this is not a difference in the *germ-bands*, it is a difference in the amount of *yolk*. *Stenobothrus* has a direct development, *Musca* undergoes a profound postembryonic metamorphosis; the former needs a great deal of yolk because its embryonic development is long and complicated, the latter but relatively little yolk, because its embryonic development is very short and comparatively simple. Although Prof. Graber was aware of the existence of transitional forms between his long and short germ-bands, it seems never to have occurred to him while writing the ten long quarto pages, which he devotes to this and similar distinctions, that the true differences lie in the quantities of yolk with which different eggs are provided. This is a strange omission for an embryologist to make after all that has been said and written on the effects of yolk on development. *Verum operi longo fas est obrepere somnum*.

Equally artificial and useless is Prof. Graber's division of germ-bands into straight and crooked (tanyblastic and ankyloblastic). It is obvious that the curvature of a germ-band depends on the character of the yolk surface on which it happens to lie. Thus the germ-band of a spherical egg is necessarily curved (*Phryganeidæ*), while the germ-band on the long side of an elongate, oval egg will be more or less straight (*Blattidæ*). It is somewhat disappointing to find that no attention is devoted to the important relations of the germ band to the micropylar axis, a subject on which Hallez has published two

suggestive little papers (*Comptes rendus*, v. 101, 1885 and v. 103, 1886).

Prof. Graber finds the abdomen of the embryo insect to consist of *eleven* true segments. He believes that he has found distinct traces of coelomic cavities in the last (eleventh) segment, and figures them in *Mantis* and *Hydrophilus*. If correct, this observation is of great interest, since Haase has recently maintained, after an exhaustive study of the facts of larval and imaginal structure, that there are only ten segments in the insect abdomen, the "afterstück" not being a true segment.

The antennæ are shown by Prof. Graber to be decidedly postoral in their origin. Reichenbach pointed out that of the two pairs of antennæ in *Astacus* the first arises on a level with the mouth, while the second is postoral. As far as their relation to the mouth is concerned, therefore, the antennæ of insects would, correspond to the second pair of antennæ in *Crustacea*. The labrum arises, as Prof. Graber points out, from a pair of appendage-like organs. The honey-bee is cited as an exception to this general rule, the labrum of this species having been described as an unpaired appendage from the first. But Carrière has recently shown that the labrum of the wall-bee (*Chalicodoma muraria*) arises as a pair of papillæ at first separated at their bases, but subsequently uniting to form a single piece. Prof. Graber has not succeeded in throwing any new light on the obscure question as to whether the labrum represents a pair of true appendages serially homologous with the antennæ, mouth-parts, legs, etc.

A lengthy chapter is devoted to a consideration of the abdominal appendages of insect embryos. Among the numerous facts recorded the most valuable are those relating to *Hylotoma berberidis*. In this Tenthredinid the German investigator succeeds in establishing direct continuity between the embryonic abdominal appendages and the pro-

legs of the caterpillar-like larva. He finds that during embryonic life each of the eleven abdominal segments presents a pair of appendages. Those on the 1st and 7th-9th segments soon disappear, while those on the remaining segments persist as the prolegs of the larva. The pair of appendages on the tenth segment, which are at the time of their origin in line (homostichous) with the appendages of the preceding segments, move pleurad, and thus become ectostichous. On the 11th segment the appendages ("afterspitzchen") are close together (entostichous). It is this last pair of appendages which corresponds to the anal legs of Lepidoptera, since, in the true caterpillars, according to Prof. Graber, the anal legs do not belong, as Haase and other investigators aver, to the *tenth*, but to the *eleventh* abdominal segment. Prof. Graber's figures are certainly far from being conclusive on this point. The peculiar cerci of *Lyda* belong to the tenth segment and are not therefore homologous with the anal legs of Lepidopterous larvae.

It is also interesting to note that the formation of the embryonic envelopes and the manner in which the dorsal body-wall is completed in the embryo *Hylotoma* strikingly resemble what is observed in Lepidoptera. This fact may prove to be of use as further evidence of a common ancestry for the Lepidoptera and Hymenoptera. The embryology of *Hylotoma* certainly appears to bear out the conclusion long since drawn from the adult structure of the Phytophaga, viz.: that this group is the most primitive among existing Hymenoptera. When we pass from a Tenthredinid to an Apid it appears that the embryonic envelopes show a tendency to become aborted, just as they do in the Diptera, in passing from an old form like *Chironomus* to a recent form like *Musca*. The general validity of this remark is in no wise impaired by the difference in the kinds of abortive change undergone by the envelopes in the two orders.

W. M. WHEELER.

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[From Lowne's Anatomy, etc., of the blow-fly, p. 190. London, 1891.]

FULL-GROWN LARVA AND PUPA OF DEIDAMIA INSCRIPTA.—On July 13, 1890, I found on *Ampelopsis veitchii*, in Brookline, Mass., a larva a trifle over two inches in length.

The head was round, green, with a faint white line on each side of the median suture. The body tapered from the fourth segment to the head, and was clear, bright green, without obliques. Two pale yellow lines extended from the head over the dorsum of the first three segments. A brighter yellow-white line extended up each side of the caudal horn, and a little way down on the sides of the body—like the "last pair of obliques" of many sphingid larvae, only extending by no means so far down on the body. There was a thick wavy stigmal edge from 1st segment to the tip of anal flap. The body was not rough, but striated transversely. The caudal horn was green except on the sides where the yellowish lines came. Feet and prolegs green, spiracles unnoticeable.

On July fifteenth it stopped eating, and, on the seventeenth pupated. The pupa was 1 3-16 inches (20 mm.) long, slender, brown mottled with greenish on the back. The abdominal segments were "honey-combed" with tiny

darker brown depressions. The tongue-case was a sharp ridge extending to the apex of the wing-cases. At its base, on each side, was a dark, rough tubercle; on each eye-cover was another; and on the apex of the head another. The anal hook was long and pointed, with a little spur near the tip.

Caroline G. Soule.

ON THE FOOD-HABIT OF *TELEA POLYPHEMUS*.—On June 10th emerged in one of my boxes a ♀ *Telea polyphemus* of normal size and specially brilliant coloring. Its larval history was an experiment in food. The larva was found just before the third moult, on a small oak tree. Its food was varied every day, and consisted of the following leaves, given in the following order:—

Oak, maple, willow, pine, white birch, apple, chestnut, moosewood, wild grape, poplar, walnut, elm, cherry, and then began with oak again. The only leaf it refused was sassafras.

Chestnut, pine, and wild grape were new to me as food-plants of *T. polyphemus* and were suggested by finding larvae on them several times last summer.

The larvae on pine were especially large and clear in color; those on wild grape, markedly smaller.

Caroline G. Soule.

RECENT LITERATURE. — Mr. J. W. Tutt, who edits a journal whose special function is to record all sorts of variation in insects has just published the first volume (16, 164 pp.) of "The British Noctuae and their varieties" in which over 100 species and an enormous number of varietal forms are described and named; scarcely a single species escapes division, and some show ten or fifteen varieties (*Apamea didyma* for instance), while a distinction is further made between varieties and subvarieties. Only the imago is considered. A large amount of the material is new, but the author has carefully collated all fragmentary notes in the literature of the subject. In the introduction,

which treats of variation in Lepidoptera generally, its nature, extent and probable causes, no reference is made to the claim the author elsewhere refers to (Ent. rec., 1, 55-56) that melanism has in some instances become a prevailing feature in those parts of England where manufacturing plants have given a grimy aspect to nature. If this be really true, and it would seem to be difficult to prove incontestably, then natural selection by elimination of the unfittest has certainly produced a sensible degree of protective mimicry within recent historic times.

A painstaking, detailed account of the postembryonal development, habits, and anatomy of *Encyrtus fuscicollis* has just been given by Dr. E. Bugnion in the *Recueil zoologique suisse*, accompanied by half a dozen folding plates. The species investigated is claimed to be parasitic on different caterpillars, and among others on a *Hyponomeuta* attacking the spindle tree in which the author studied them. He raised 21 different lots, and they usually yielded males or females exclusively, and in half the other times one sex was in excessive abundance. This *Encyrtus* appears to lay its eggs (50-129) at one thrust in the form of a single chain which floats in the perivisceral cavity. At the end of the embryonal period, or rather after the first moult, the larvae pierce this tube, and live on the lymph of the host till they are ready for their change, when they devour the viscera, form separate cocoons which pack the body of the host to the utmost, and appear in the imago state in about three weeks; they at once pair. Whether they are double brooded and in the second generation infest some other insect is still a question; if not, the maintenance of the species depends on the life of fertilized females from early in August to sometime in April or May of the succeeding year.

The most considerable and valuable work that has appeared for fifteen years on the tertiary insects of Europe, has just been published at Strassburg as part of the *Abhand-*

lungen zur geologischen specialkarte von Elsass-Lothringen. It is on the insects of the middle oligocene of Brunstatt, Alsacia, by Dr. B. Foerster, and describes 159 species, all but one belonging to the Coleoptera, Hemiptera, Diptera, and Hymenoptera to name them in the order of their abundance. Six excellent plates, including 171 figures, all drawn by the author, accompany the work. Two of the beetles, a *Dorcatoma* and a *Bruchus*, the latter rather imperfect, presented no features by which they could be distinguished from living European species. The mass of the species are of a small size. Interesting comparisons are instituted with the insects of other tertiary localities.

PERSONAL NOTES. Entomologists everywhere will deeply regret to hear of the death of Mr. Henry Edwards who loved his favorite studies quite as much as he did the stage and brought to both an ardor and freshness contagious and perennial. "Do mention," writes one of his correspondents, "his unwearying kindness and unfailing help to entomologists who were more ignorant than himself. I owe much to his help and encouragement and shall miss him sorely, though I never saw his face," and these qualities which so endeared him to a large circle of friends were indeed conspicuous in that face.

Two entomologists have recently received appointments at Harvard university though not in the field of entomology: Dr. Roland Thaxter as assistant Professor of cryptogamic botany and Mr. J. G. Jack as Arboretum lecturer for 1891-1892.

PROCEEDINGS OF SOCIETIES.

CAMBRIDGE ENTOMOLOGICAL CLUB.

13 DECEMBER, 1889.—The 150th meeting of the Club was held at 156 Brattle St., the president in the chair.

Dr. H. A. Hagen said that from a recent study of the species of *Anax* he thought that *A. concolor* and *A. longipes* were identical and that the number of species so called should be reduced.

Mr. S. H. Scudder, referring to the fossil plant-lice found at Florissant, said that most of the species belonged to the Aphidinae and a very few to the Schizoneurinae. As a whole the species differ notably from modern types in the length of the stigmatic cell and in this respect they agree with the species from amber and a form figured by Brodie from the secondary rocks of England.

Mr. Scudder said that in a psocid from the tertiary rocks of White River, the ocelli were very large and encroached upon the eyes.

He also showed a photograph of the fossil butterfly (*Barbarothesa*) mentioned at the last meeting and called attention to the comparative shortness of the palpi.

10 January, 1890.—The 150th meeting of the Club was held at 156 Brattle St., the president in the chair.

The secretary read a letter from Mr. B. Pickmann Mann of Washington, in which, after wishing the Club and its members a happy and prosperous new year, he detailed an account of the financial condition of volume four of *Psyche*.

The report of the retiring secretary, Mr. Roland Hayward, was then read, accepted, and ordered to be placed on file. The retiring treasurer, Mr. Samuel Henshaw, then presented his report, which was laid on the table for action, till the report of the auditors should be received.

The Club next proceeded to ballot for officers for 1890, with the following result: President, C. W. Woodworth of Fayetteville, Ark.; Secretary, Roland Hayward; Treasurer, Samuel Henshaw; Librarian, George Dimmock. Members at large of Executive Committee, Holmes Hinckley and Samuel H. Scudder. Messrs. George Dimmock and Samuel Henshaw were elected editors of *Psyche*.

The retiring president, Mr. Samuel H. Scudder, then read his annual address, entitled, "The work of a decade on fossil insects." (See *Psyche*, 1890, v. 5, pp. 287-295.)

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PSYCHE.

SOME OLD CORRESPONDENCE BETWEEN HARRIS, SAY, AND PICKERING.—II.

[HARRIS TO SAY.]

MILTON, Dec'r 22, 1823.

Dear Sir,

It was with great pleasure that I received your interesting letter, in reply to the one, which I had the honour of addressing to you. Your attention to my queries has emboldened me to trouble you with another communication.

Our coasts and waters are extremely barren of varieties of shells; but few being found except the most ordinary & common species of *Mya*, *Balanus*, *Solen*, *Cardium*, *Ostrea*, *Mytilus*, *Murex*, *Turbo*, & *Helix*. I have no collection myself, but may, perhaps, be able to procure you some of these from my friends. The coat of mail, or *Chiton*, I have never seen. If you will point out by what conveyance I shall send you the insects described by the late Professor Peck, I shall be happy to forward them. Possibly a private opportunity may shortly occur to me. The summer past, I procured a dozen or more specimens of *Xenos Peckii*; but the insects were so small that I did not succeed in preserving more than 2 or 3; one of which is at your service if desirable. Prof. Peck described the insects, named in my former letter, for the *Journal of the Mass. Agricult. Soc.*

They are now out of print; but if I can procure the numbers containing his accounts. I shall endeavour to present them to you. The papers & lectures of this lamented friend are in my hands, and will be published by my father & myself, as soon as subscriptions to a sufficient amount shall be obtained. Many of his drawings are exquisitely fine, & some of these it is proposed to have engraved for the work. For the sake of the widow, and orphan son it is desirable that it should be published; I am doubtful however, whether it will quite equal the expectations of all. His friends could have hardly expected so much from a self-taught naturalist, who, for nearly twenty years, pursued, but with scanty resources, his studies in obscurity; and who, in his latter and more prosperous days, was a victim to the repeated attacks of disease. A short sketch of the life of this most interesting & amiable man will be prefixed to the volume, and will then enable the public to appreciate his merits, & to commiserate his misfortunes.

In the month of August last, I discovered *Cantharis marginata* on the banks of the Neponset, and have included an account of it in a paper on our indigenous medicinal species, drawn up for the *N. E. Medical Journal*: it

will appear in the number, which is to be issued in April. By the solicitations of one of the editors of the Boston Journal of Philosophy, &c., I have consented to its publication in the number of that Journal for February next. The object of this paper is principally to clear up some mistakes arising from ignorance of the species, & to collect some facts of practical utility; it will be only interesting in this vicinity. Should you see it, you will find your information on the subject duly honoured. It was my good fortune also to trace the progress of the Peach-tree insect; and having, in July, obtained it in its perfect state, I concluded that it must be a *Zygæna*, according to Fabricius' character of that genus, in his *Entomologia Systematica* (1793). An account of it I presented to an agricultural friend, John Lowell, Esqr., & proposed to call it *Zygæna* (*Persicæ*) *cyanea*, *alis posticis hyalinis*; *abdomine barbato*, *cingula croceo*. Soon afterwards, I obtained, what I took to be another species, from the Cherry-tree; the larva being found to infest excrescences on the trunk and limbs. This, as well as the former, I was unable to find in Fabricius' *Glossata*, & placed it in my collection with this definition—*Zygæna* (*Cerasi*) *alis hyalinis*, *marginè fasciæque anticarum cyaneis*, *abdomine barbato*, *chalybato*; *barbâ apice alba*; *pedibus chalybatis*, *geniculis aureis*, &c. This insect I afterwards obtained also from the peach tree; inhabiting, like the preceding, beneath the bark at the root. Still, the two were so dissimilar

that I could not suppose them to be merely the sexes of one species. Your having remarked the great difference, in appearance, of the sexes of *Aegeria exitiosa*, has led me to think that, these may be the same you mention by that name. Please inform me whether my definitions correspond with your specimens; &, if so, whether you are fully persuaded that they are but sexual distinctions. My insects are certainly nearer related to the genus *Ægeria* of Leach, in the *Edinburgh Encyclopædia*, than to that of *Zygæna*. Does this latter genus, according to the new arrangement, contain insects with the anus bearded; or are we to look to the antennæ alone for a distinction from *Aegeria*? I have discovered, here, another insect, probably of the same genus, which may be thus described—*Ægeria* (*fulvicornis*) *brunnea*, *alis posticis hyalinis*; *marginè postico*, *stigma-teque costali fuliginoso*; *antennis*, *tarsisque fulvis*; *abdomine barbato*.* There is a beautiful *Bombyx*, quite common here, it appears to be a non-descript, & Prof. Peck proposed to call it *B. Trifolii*, from the larva being very fond of the common clover. I have also found it feeding occasionally on the leaves of the Balsam Poplar, & the American Elm. Male sulphureous: upper wings with two irregular lines & a central macula ferruginous; under wings with an ocellus & arc of a blue-black colour; & an external arc & the

* Habitat unknown to me: found in meadows: magnitude of the first mentioned.

inner margin lateritious. Pupil of the ocellus pale, with a central white dash. Length from tip to tip of the expanded wings $2\frac{3}{4}$ inches. Female fuscous; upper wings with the lines & maculæ dark & somewhat hoary; under wings croceous, with the same concentric arcs & pupil as the male. Length between the wing $3\frac{1}{2}$ inches. The larva of this Bombyx is particularly curious — it is between 2 & 3 inches long, & covered with greenish or light yellow *spines* which, *like those of the nettle are perforated, stinging, & contain a poisonous liquor*. The chrysalis hibernates in a thin, silky, firm, cocoon; & the perfect insect is developed about the middle of June. It may, perhaps, be well known to you; if so, what do you call it?

In the Edinburgh Encyclopædia I find many genera, of the order Lepidoptera, accredited to Fabricius, which do not appear in his Entomologia Systematica, printed in 1793; nor do I know in what work of Fabricius these genera are to be found. This makes it extremely difficult to study the order Lepidopt. and almost impossible for a novice to ascertain the species which belong to the modern genera. Is Coquebert's Decade a very valuable book to the student, and can you inform me its cost & probable utility?

I should like much to see Mr. Worth's paper, when published.

If I do not intrude on your time & patience, I hope you will allow me, occasionally, to address you; & in return, to favour me with your replies.

In this way you will, from the centre of science in which you preside, shed light on an obscure individual, groping his way without access to books, & unaided by instruction, but anxious for information, & desirous to obtain it from the best sources.

Be pleased to receive my congratulations on your safe return from your late expedition, & my hopes that it will be productive, to yourself, both of honour & reward.

I am, Sir, with great respect,

Your humble serv't

T. WM. HARRIS.

P. S. May I not hope to hear from you soon?

[DRAFT OF REPLY BY THOMAS SAY.]

Dear Sir—

I avail myself of a leisure interval to reply to your letter of the 22nd ult. I was not aware that an *Ægeria* inhabited the Cherry tree, but of the fact there can be no doubt as you found the larva in the trunk and limbs of the tree. Your desc'n of this insect and that of the specimen from the peach tree, agree perfectly with those I have desc'd as the sexes of *Æ. exitiosa*. That my two specimens are male & female I have no doubt, but that they are sexes of the same species I hold Mr. Worth responsible; they do indeed differ very much in appearance, but so also do other sexes of identical species of the same genus. The anus of *Ægeria* is far more obviously bearded than that of *Zygæna* many of which latter are

altogether destitute of elongated hairs on that part, the antennæ however are widely different. I do not remember to have met with the third sp. of *Æ.* you mention; but your description of the *Bombyx* agrees perfectly with B. Jo of authors, yet, I cannot suppose that Profess'r Peck was unacquainted w. that insect which is so common in nature & familiar in the books; if indeed it is not that species it is without doubt new.

Fabr. did not live to publish his *Systema Glossatorum*, but the work was left in manuscript, & was finally publ'd, I think, by Illiger, but I have never met with it, & have therefore, with you, to rely entirely on the *Edinb. Encyc.* for his genera. Coquebert in his *Decades* proposes to illustrate the works of Fabr. by figures; his figures are good & represent the genera as they stood at that time, but so many divisions have been since made that the book might

lead to error if implicitly relied upon. I have seen but one copy of this work, & doubt much if it can be purchased in this country. I have no idea of the price in Europe. It is a folio vol. & contains if I remember rightly 30 plates.

The number of the *Journal A. N. S.* containing Mr. Worth's obs's on the Peach tree destroyer will be published about Tuesday next. I thank you for mentioning the name of the work in wh. Prof. Peck published his desc's, we have the *Jour. Mass. Agric. Soc.* here & I can refer to them.

To communicate any information I may possess to those who are in pursuit of knowledge in Zoology, affords me, I assure you, much gratification, I therefore hope that you will not scruple to command me freely, though on the other hand such are the nature of my avocations I cannot promise always to answer promptly.

SOME OF THE EARLY STAGES OF ZERENE CATENARIA.

BY SAMUEL H. SCUDDER.

On September 24, 1859, I raised a female of this species, and kept her in confinement. On the third day she began to lay eggs and in the next two or three days laid 259 of them. Two years afterwards I placed a similar female, as soon as born, alone in a large box with a sprig of sweet fern (*Comptonia asplenifolia*), but her eggs were in all cases dropped loose in the box. The eggs are about 0.75 mm. in height,

ovato-spheroidal, truncate at base, very minutely punctured, and of a somewhat pale pea-green color. None hatched.

The caterpillar is very common on sweet fern, and is said by Packard to feed upon *Carex pennsylvanica*, and also on "blackberry, woodwax, wild indigo, etc." It lives solitarily, though many are often found upon a single plant, and when full grown may be frequently seen extended in a straight rigid

position upon a twig, supported only by its two pairs of prolegs, the body at an angle of about forty-five degrees with the terminal segments. In this position it may remain a long time.

Its general color is a greenish lemon yellow or straw color. The body is largest at the seventh abdominal segment, and tapers very regularly and gently in each direction, the head being scarcely broader than the first thoracic segment. The head has the mouth parts white, a transverse series of three black dots on the frontal triangle, and on each lobe of the head a series of four similar dots arranged in a quadrilateral. The body is marked by several longitudinal series of very delicate reddish brown lines, two on either side above and three on either side below the spiracles, those above being apparently latero-dorsal and infralateral, the latter the finer; the first thoracic segment bears a rounded dorsal shield with four black dots arranged in a quadrilateral, and on either side of each thoracic segment is a single, on that of each abdominal segment a pair, of short, transverse, black spots (one in front of and one behind the spiracle) the lower ends of which are on the stigmatal line; each of the legs has a pair of black dots and each of the prolegs two vertical series of similar dots, the hinder series of the hindmost pair forming a triangular cluster, its apex downward; the last segment has an arcuate series of four black dots, opening forward, besides a cluster of smaller ones at the extreme posterior margin, and the penultimate a transverse series of four dots next the posterior edge, two subdorsal and two stigmatal; spiracles marked by a black dot encircled with milky white. Length 45 mm.

The cocoon is an ovate open-meshed net about 25 mm. long by 8 mm. in greatest breadth, made of shining yellow silk; the meshes are so open that the

caterpillar in making the cocoon can thrust its head through any of them. yet on completion the cocoon is rigid and yields to handling less than many compact cocoons, so stiff are the threads. It is also strengthened by the guys which attach it to the surrounding foliage. When completed, it is much shorter than the enclosed caterpillar, which is obliged to lie in a cork-screw-like position until his change occurs, and then by his contortions he contrives to eject the cast skin through the meshes of the cocoon.

The chrysalis is of a white color, though a pale pea-green tint suffuses the thorax and appendages, especially on the ventral side, and the abdominal segments are edged posteriorly with lemon yellow, except the last two which are black. There are also some other distinctive marks: the head is covered with short curved irregular lines and dots, and has a few yellow spots on top; the ocellar riband is black; all the incisures of the appendages are marked with black, and the wing veins are indicated by ragged black lines now and then interrupted; there is a dorsal yellow streak on the abdomen which is bounded by short black lines and dots; cremaster yellow except the reddish testaceous tip. Length 22 mm.; breadth 4.5 mm.

An inky tinge begins to suffuse the body about three days before emerging; it first affects the dorsum of the thorax, then it extends to the head and rest of the thorax except the wings and to the ventral portion of the abdominal segments just succeeding the wing-tips, and finally to nearly the whole body. I once chanced to observe a moth while emerging; it had thrust its body forward out of the chrysalis skin

so as to touch the cocoon. I saw it force its way out through one of the meshes, which it did in a few seconds by a series of starts, pushing itself with its legs and opening and contracting its limp wings; it made use of any limb as soon as it was free from its encasements, and as soon as it was out of the cocoon it took up a position where its wings could properly hang and expand.

Most of the imagos bred by me came

out in the third week of September; one was in chrysalis from August 23 to September 24, or thirty-two days. As, according to Packard, there is but one brood a year and eggs are laid very soon after hatching, it is probable that winter is passed in the egg state. Packard figures the caterpillar, but not (as he says) the pupa, in his Monograph of the Phalaenidae. (From notes taken in 1859 and 1861.)

A LIST OF THE BOMBYCES FOUND IN THE ELECTRIC LIGHT GLOBES AT POUGHKEEPSIE, N. Y.

BY HARRISON G. DYAR, NEW YORK.

During the summer of 1890 I made nine visits to the electric lamps of Poughkeepsie and the following list shows the number of Bombyces that they contained at each visit, with totals. I have included also the names of all Bombyces that I have found in western Dutchess County even though not found in the lamps in 1890. The numbers will give a fair idea of the relative abundance of the different species. To my surprise I found *Halesidota tessellaris* the most abundant though, judging from the larvae, it was no more common than usual, while *Clisiocampa americana*, which was second in abundance, was unusually common, doing much injury to the wild cherry and apple trees.

I visited about one-third of the electric lights in Poughkeepsie and took al-

together 7874 specimens. The list contains 114 species. The seven most numerous species, those comprising one per cent or over of the total number, were the following:—

	Per cent.
<i>Halesidota tessellaris</i> Sm. Abb.	34
<i>Clisiocampa americana</i> Harr.	31
<i>Hyphantria</i> var. <i>textor</i> Harr.	16
<i>Spilosoma virginica</i> Fabr.	1
<i>Clisiocampa disstria</i> Hübn.	1
<i>Hyperchiria io</i> Fabr.	1
<i>Pyrrharctia isabella</i> Sm. Abb.	1
All the rest together (88 species)	15

I was greatly assisted in making the collections here recorded by the kindness of Mr. J. H. Van Norstrand of Poughkeepsie who takes care of the electric lights I visited.

[illegible]

	June 14.	June 20.	June 24.	July 2.	July 9.	July 17.	July 28.	Aug. 4.	Aug. 14.	Totals.
<i>Packardia elegans</i>	..	..	..	..	..	..	..	..	..	0
“ <i>fusca</i>	..	..	..	..	..	..	..	..	..	0
“ <i>geminata</i>	..	..	..	..	..	..	..	..	..	0
“ <i>albipunctata</i>	..	..	..	..	..	..	..	..	..	0
<i>Tortricidia flavula</i>	..	..	..	..	..	..	..	..	..	0
<i>Lacosoma chiridota</i>	..	..	1	..	..	..	..	..	..	1
<i>Ichthyura inclusa</i>	..	..	..	1	..	..	..	..	..	1
“ <i>vau</i>	..	1	..	..	..	..	..	..	15	16
“ <i>albosigma</i>	..	..	..	..	..	..	..	1	..	1
<i>Apatelodes torrefacta</i>	1	2	..	1	1	..	..	..	..	5
“ <i>angelica</i>	..	..	..	1	4	2	..	..	..	7
<i>Datana angusii</i>	..	..	..	1	..	..	..	..	..	1
“ <i>ministra</i>	6	3	..	2	11	19	3	7	..	51
“ <i>drexellii</i>	..	..	..	..	1	..	1	..	..	2
“ <i>major</i>	..	..	..	..	1	..	..	1	..	2
“ <i>palmii</i>	..	..	..	..	2	..	..	..	..	2
“ <i>integerrima</i>	1	1	1	1	5	7	..	1	..	17
“ <i>contracta</i>	..	..	..	..	..	..	..	..	..	0
“ <i>perspicua</i>	..	..	..	..	22	27	2	9	5	65
<i>Nadata gibbosa</i>	1	1	..	..	1	2	..	..	..	5
<i>Gluphisia trilineata</i>	..	..	..	..	..	..	..	..	..	0
<i>Notodonta stragula</i>	..	..	..	..	..	..	1	1	..	2
<i>Lophodonta ferruginea</i>	..	..	..	..	1	..	..	..	..	1
“ <i>angulosa</i>	..	..	..	..	..	..	..	..	..	0
“ <i>georgica</i>	..	1	..	..	..	..	..	..	..	1
<i>Pheosia rimosa</i>	..	..	..	..	..	..	..	1	2	3
<i>Nerice bidentata</i>	..	..	..	..	..	..	..	5	3	8
<i>Edema albicosta</i>	3	7	2	10	2	3	..	2	..	29
<i>Ellida gelida</i> *	..	..	..	..	..	..	..	..	..	0
<i>Seiroidonta bilineata</i>	3	2	2	6	4	1	..	3	5	26
<i>Oedemasia concinna</i>	..	1	..	..	..	..	..	2	..	3
<i>Dasylophia anguina</i>	..	..	..	..	1	..	..	..	..	1
<i>Schizura ipomeae</i>	..	..	..	1	..	..	..	..	1	2
“ <i>unicornis</i>	..	..	..	..	..	1	..	..	6	7
“ <i>badia</i>	..	..	..	..	..	..	..	..	..	0
“ <i>leptinoides</i>	..	1	1	..	..	2	..	..	..	4
“ <i>eximia</i>	..	..	..	..	1	..	..	..	..	1
<i>Ianassa lignicolor</i>	2	..	..	1	..	2	..	5	1	11
<i>Heterocampa obliqua</i>	..	..	..	..	..	1	..	2	..	3
“ <i>manteo</i>	..	..	..	..	..	1	..	1	..	2
“ <i>guttivitta</i>	2	4	..	1	..	..	..	..	..	7
“ <i>biundata</i>	..	..	..	..	..	..	..	2	2	4
“ <i>unicolor</i>	..	..	..	..	..	..	..	1	2	3
“ <i>marthesia</i>	..	1	..	..	..	..	..	..	..	1
<i>Cerura borealis</i>	..	..	..	..	..	..	1	..	..	1

* One specimen in electric light July 11, 1889.

	June 14.	June 20.	June 24.	July 2.	July 9.	July 17.	July 28.	Aug. 4.	Aug. 14.	Totals.
<i>Cerura occidentalis</i>	..	..	..	..	..	1	1	10	3	15
" <i>aquilonaris</i>	..	..	..	..	..	..	..	..	..	0
" <i>cinerea</i>	..	..	..	1	1	3	..	..	1	6
" <i>multiscripta</i>	..	..	..	..	..	..	..	..	1	1
<i>Platypteryx arcuata</i>	..	..	..	..	..	..	..	..	..	0
<i>Dryopteris rosea</i>	..	..	..	1	..	..	..	..	..	1
<i>Actias luna</i>	..	1	..	1	..	..	..	..	..	2
<i>Telea polyphemus</i>	1	1	3	9	13	7	4	14	2	54
<i>Calosamia promethea</i>	..	..	..	..	3	1	..	..	..	4
" <i>angulifera</i>	..	..	..	..	1	..	..	..	..	1
<i>Platysamia cecropia</i>	1	3	4	23	15	3	..	..	..	49
<i>Hyperchiria io</i>	12	13	14	20	27	9	9	2	..	106
<i>Eacles imperialis</i>	..	2	1	5	16	7	5	4	..	40
<i>Citheronia regalis</i>	..	2	1	1	4	1	1	4	..	14
<i>Anisota stigma</i>	1	..	..	3	3	2	..	..	..	9
" <i>senatoria</i>	..	..	..	..	..	..	..	..	..	0
<i>Dryocampa rubicunda</i>	3	..	..	3	8	8	2	2	2	28
<i>Clisiocampa americana</i>	15	508	1382	429	82	3	..	..	..	2419
" <i>diastria</i>	..	1	..	82	29	..	1	5	..	118
<i>Gastropacha americana</i>	..	..	..	1	1	..	..	..	..	2
<i>Tolype laricis</i>	..	..	..	..	..	..	..	..	4	4
" <i>velleda</i>	..	..	..	..	..	..	..	..	..	0
<i>Prionoxystus robiniae</i>	..	1	1	2	2	3	..	..	1	10
Totals per visit.....	118	881	1579	1424	1199	1074	178	918	503	
Total number of moths taken.....										7874

EXPERIMENTS WITH ALPINE BUTTERFLIES.

BY SAMUEL H. SCUDDER.

Before noon on July 17 last, the morning being fair, I caged half a dozen *Oeneis semidea* ♀ on a pot of growing sedge in an open south window, in the hotel on the summit of Mount Washington, N. H. The afternoon and all the next day the mountain was enveloped in clouds, and no eggs were laid before July 20 when, by eight o'clock, a single egg was seen; during that day and the next, both of which were fair, about eight or nine eggs were laid, perhaps a

few more. July 20, at about 2 P. M., two more cages were stocked, both out of doors on growing sedge, and in one five, in the other seven females were placed. These were examined about twenty-four hours later; three eggs were found in the former, none in the latter, and all the females were replaced where the five had been, and left in the care of Mr. H. H. Lyman who remained longer on the mountain. Into the cage in the house half a dozen more

butterflies were placed on the afternoon of the 21st, and at seven o'clock the next morning this cage was taken to Cambridge and carefully examined, with the result of finding twenty-six eggs; most of these were laid on the dead last year's blades of sedge; a number were found on the wire hoops supporting the netting; still fewer on the green blades of the sedge,—perhaps four or five; one on a piece of brown paper in which the pot was wrapped, but none either on the netting, the edge of the flower-pot, or the ground.

Toward the end of July, 1887, as reported in my *New England Butterflies*, p. 146-147, I carried three females of this butterfly down the railway on Mount Washington to the base, and found them apparently affected by the change so as to be unable to fly. I thought it would be well to repeat the experiment and extend it; accordingly, when I left the mountain July 22, I did not disturb the butterflies I had placed in the cage until I reached Cambridge, or just before dark of the 22d. The butterflies were all of them affected as described by me before, but to a slightly less extent, none lying quite helpless on their side and some, after being fairly down the mountain a few hours, keeping their wings tightly closed continuously as they hung from the lace. It is possible (though I do not think it at all probable, from the nearly continuous shaking of the train) that some of the eggs mentioned were laid after leaving the summit of the mountain, but some have certainly been laid since their arrival at the seaboard,

for one was seen laid on July 23, seven were found on July 24 and twelve more on July 25. Their behavior below when attempting flight is quite the same as one finds on startling them up from the sedge toward the close of the day on the mountain; they flutter close to and in contact with the ground as if injured, and unable even with desperate efforts to get away.

It was a somewhat curious coincidence that I heard on my return that Mr. W. H. Edwards had received in West Virginia a lot of *semidea*, male and female, sent alive in a pasteboard box from Mount Washington; half were dead, but two of the females were lively and wandered about the cage in which he placed them. It is quite evident, then, that the change to a lower level does not interfere with their activities to the extent that I supposed it did.

Oeneis semidea is very abundant this year; a single larva in last stage but not quite fully grown was found under a stone on July 20.

During our stay on the mountain, Mr. Lyman and I searched in vain from the Ledge to Tuckerman's Ravine, in all its best known haunts, for *Brenthis montinus* without seeing one, and I am quite convinced that it was not on the wing. But an interesting capture was made of *Eurymus interior*, males of which, to the number of a dozen or two, were seen in the lower half of the woodless region. The only other butterflies seen above timber were *Argynnis cybele*, *Pieris rapae*, and *Euphœades glaucus*.

EDWARD BURGESS.

The death of Mr. Edward Burgess of Boston on July '12 at the age of 43 removed one of the few persons in America who have made important contributions to insect anatomy.

His work was not voluminous but it was very careful and exact. As president of this Club he gave in 1880 an excellent review of the then recent literature in insect anatomy and physiology. His own most important and extensive paper was on the anatomy of the milk weed butterfly, but he worked out in more or less detail the anatomy of the perfect stage in *Anabrus* and *Aletia* and studied minutely the male abdominal appendages of butterflies, the structure of the head of *Psocidae*, the mouth parts of the larva of *Dytiscus* and the varied course of the aorta in *Lepidoptera*. He was also the first to show the precise structure and working of the apparatus for feeding in the imago of *Lepidoptera*.

A large part of his work was in aid of the researches of others, in which he was generous almost to a fault, and his unselfish devotion to his duties for sixteen years as secretary of the Boston society of natural history, in whose publications most of his papers were issued, brought the office to a high state of efficiency—a devotion further signalized in his will, in which he made the society his contingent residuary legatee. Besides, although he published but a single short paper on *Diptera*, his knowledge of this group, in which he rendered large service to others, was unsurpassed among our countrymen.

To entomology, which he had cultivated with such signal success, Mr. Burgess, it is true, died several years ago when he parted from his collection and library and turned his attention exclusively to naval architecture in which he had been interested from boyhood and which offered far more promise of financial returns, then first absolutely necessary

for him to consider. His world-known success in his new field (for he fairly leaped into fame) it is not the place here to consider, but, clearly the greatest genius our country has ever produced in this branch of science, his naturalist friends without exception will agree that in losing him from their immediate ranks Science at large has been the gainer; they were indeed eager to applaud his success, his old scientific friends being, we believe, the very first to give him a tangible proof of their pride in his fellowship—a pride all the greater for the almost painful modesty with which he received every mark of his growing fame. Selfishness could not live in his sight. When the city of Boston gave him a public reception, his shrinking boyish figure as he rose to return his thanks, in which he tried to turn public attention rather to the one whose means, whose confidence and whose sympathy had rendered the realization of his scientific genius practically possible, will not soon be forgotten by those who witnessed it. But the gentleness and sincerity of his character, the refinement of his life and manners, his truthfulness and loyalty, and all those other delicate traits which revealed his heart and rendered him so dear to his intimate friends will remain to them a source of perennial inspiration.

THE LONDON INSECTARY.

The following extract from a recent number of *Nature* shows that America is largely drawn upon for interesting insects in the display at the insect-house of the Zoological Society of London, and yet no special mention is made of our large and striking *Bombycidae*. It suggests that when the contemplated natural history gardens in Boston are fairly established, we can easily rival any exhibitions of this nature now existing.

"The insect-house in the Zoological Society's Gardens is now in excellent order,

and well deserves a visit. In addition to the silk-moths that are usually present during the warm weather, the Papilioninae, or swallow-tail butterflies, afford at the present time the chief display. The perfect insects of several species of the genus *Papilio* have appeared—*P. cresphontes*, *ajax*, and *asterias* from North America, *P. alexanor* from the Mediterranean shores, and the handsome *P. maackii* from Japan. The last named has been seen for the first time in the house this year, and offers a striking contrast to the other species of the genus that have previously been exhibited in the Gardens, it being of black and golden-green colours instead of the yellows and blacks that we are accustomed to in our European swallow-tails. *P. cresphontes* has appeared in large numbers in the house, but no varieties have been obtained. This also is the first season for two other beautiful Papilioninae, viz. *Doritis apollina* from Asia Minor, and the Japanese *Sericina telamon*. The latter shows considerable difference in the markings of the sexes. The North American *Limenitis disippus* can be at present seen in all its stages, and is well worthy of attention, the caterpillar moving along the leaf-stalks with a peculiar interrupted gait. Of the sphinx moths, the south European *Deilephila alecto* has already appeared, and *D. nicae* is expected. These insects are, however, not seen to advantage in confinement, as their superb powers of flight cannot be displayed in a small compartment. Two examples of the Orthoptera are alive in the house—*Diapheromera femorata*, one of the stick- or twig-insects from North America, and *Empusa egea* from southern Europe. The former has been reared from eggs laid in the insect-house, but these progeny are not so healthy as those obtained from freshly-imported eggs. The *Empusa* is of a most bizarre form, and belongs to the family Mantidae, the species of which feed only on living creatures. The public is indebted to Mr. S. H. Carver for the opportunity of seeing

living scorpions; he has sent examples of two species of this group from Egypt, both of which unfortunately are unidentified, there being obvious difficulties in the way of carrying about live scorpions and comparing them with dried specimens. There is a third scorpion, from south Europe, living with its Egyptian congeners; it has a small delicate tail, and is altogether a less frightful creature, though assuming a menacing attitude with equal readiness. A spider, *Lycosa portosantana*, from Madeira, is healthy, and is a fine creature, though insignificant by the side of its neighbour, a huge *Mygale* from South America. The latter, as well as the scorpions, is fed with mice, which are given to it dead, though in its native haunts a *Mygale* has been known to prey on living individuals of these small mammals."

RECENT ENTOMOLOGICAL LITERATURE.

The first number of the 18th volume of the Transactions of the American entomological society contains convenient analytical tables to the genera of Coccidae by Ashmead, as well as a catalogue of the described South American Asilidae by Williston; one is rather surprised to see *Dasypogon* figuring in three different places. A monograph of the species of *Cryptohypnus* found in boreal America by Horn will be welcomed by the coleopterist; it includes thirty species and they are divided into nine groups containing from one to seven species each. Other papers are less important. If the society would print a table of contents to each number on the vacant fourth page of the cover it would be very welcome, especially as the head-lines of the pages are not very distinctive.

The issue of Insect life for June is a double one and therefore makes even a better showing than usual. This journal has now certainly justified its publication, though grave doubts have been expressed as to the province of the government in the issue of a periodical, and it may still be questioned

whether such a periodical should be open to direct contributions from others than the divisional force and those in the state experiment stations working in concert with them. Particularly technical articles like Lord Walsingham's seem out of place, and it would be hard to justify them, when there are plenty of openings for their publication and they have only a very indirect bearing on economic entomology. Were such articles omitted, the periodical would certainly gain in character, and as it is, quite apart from its value on the purely economic side, no entomological periodical in the world is so rich in interesting and varied notes on the habits of insects.

Apropos of the "jumping-bean" which is twice mentioned in this number of *Insect life*, once in the answer to correspondents and again in the proceedings of the Entomological society of Washington, it may be well to call attention to a recently published foreign paper on *Carcocapsa saltitans*, and on another and nearly allied moth, *Grapholitha motrix*, which causes similar movements in the fruit of *Colliguaya brasiliensis* in Uruguay: the article, by Dr. Berg of Montevideo, will be found in the *Anales of the Sociedad científica argentina*, vol. 31. The new moth is particularly interesting since the motor power in Dr. Riley's new jumping-bean is recognized by him as also a *Grapholitha*.

Kolbe's Introduction to the knowledge of insects is so good that one must scold at its slow appearance. Begun in 1889, it has only reached its sixth number, and to judge by the scheme laid down in the prospectus it is not a quarter finished; we hope it is not, for though we find some oversights, it contains a rare collection of facts and some very interesting discussions; the present number deals with the structure of the legs and of the abdomen; the account of the ovipositor and of the claspers seems rather meagre though possibly more is to be given in the next part.

A MOULTING-HABIT OF LARVAE OF PLATYSAMIA CEANOETHI.—In watching a brood of ceanoethi larvae, which are living on wild cherry, my attention has been drawn to a habit, noticed at each moult, and which I have not seen in other Bombycid larvae. When first becoming quiet the larva spun a loose web to the twig just in front of its head, at a short distance. When the mask had fallen and the skin split in moulting, the larva grasped this loose web with its first pair of feet, and pulled itself along by it, till all the feet were free and could cling to the silk. Then moulting proceeded by the usual contraction and expansion of the muscles. This was done by every larva at every moult.

Caroline G. Soule.

A "Manual of North American Butterflies" by C. J. Maynard has just been published by DeWolfe, Fiske, & Co. of Boston. It is an octavo of over 200 pp. with ten plates and numerous figures in the text, and describes more than 600 nominal species. The first thing which strikes one on looking it over is the total absence of the slightest allusion to any of the early stages of butterflies, excepting that a single chrysalis is figured. The only reference to the fact that they have a history—a history the study of which forms the chief charm and interest in these insects, and the one thing to which all novices should be pointed—is in some such curt statement as "occurs in June and July." Not even a single reference either general or particular is given to show that such life-histories are known; we believe the word "larva" or "caterpillar" does not appear beyond the third page where the body of the work begins. The second thing we notice, considering that the book "is intended for the use of the tyro as well as for the advanced student," is the absence of a single table to distinguish the different genera of a family, or the different species of a genus. Thirty-five genera of Nymphalidae, for instance, to be distinguished by the tyro with no other

aid than plodding through each of the descriptions in turn to see which fits best; or fifty-three species of *Argynnis* in a similar plight except that here the rough but fairly good figures of the under side of a hind wing materially aid the comparison; or again eighty-six species of *Pamphila* where even figures of a single wing are wanting in more than two thirds of the species! For such characteristics as these, no possible excellence in the descriptions or the sequence, or even in the illustrations could possibly atone. It is planned upon wrong lines—a dreary guide to a delightful study. Better a single life-history well worked out, to beget a wish to learn more, than the whole of it. Butterflies are not lifeless postage-stamps, and should not be treated as such.

A very lively and interesting account is given in the last number of the *Journal of the Cincinnati society of natural history of the wanderings and collections of a "Cincinnati boy in the tropics,"* William Doherty, who entirely without funds has wandered all through the east, making fine collections in natural history, especially insects, and paying his way by their sales. Through perils and adventures innumerable he seems so far to have escaped with his life; "my beggar-like and dilapidated garb was my safeguard against robbers," he says, "and my running after butterflies was calculated to impress them that I was a harmless lunatic and so I got through where a more pretentious personage might have failed."

Reference was made in our June number, p. 100, to the reported death of Künckel, and discredit given to the story that he had been overcome by locusts in Algiers. It now appears that the entire story must have been a fabrication, for records have reached us of two or three meetings of the French entomological society (of which he was once president) subsequent to the date of his reported death, and no sort of reference to such an event appears, though at least one necrological notice is given; moreover Künckel has

since that date been appointed upon a committee of the society, and presented papers both to it and to the French Academy! We observe that *Entomological news* publishes the telegram from Algiers as if it had no doubt of its truth.

PROCEEDINGS OF SOCIETIES.

CAMBRIDGE ENTOMOLOGICAL CLUB.

14 February, 1890.—The 151st meeting of the Club was held at 156 Brattle St., Mr. S. H. Scudder in the chair.

The annual report of the librarian, postponed from the January meeting, was read and accepted. The auditors announced that the report of the treasurer was correct, and it was accepted.

Dr. H. A. Hagen asked the opinion of those present concerning books on entomology for the use of beginners and amateurs. Our common insects, *Half-hours with insects*, and *Entomology for beginners*, by Dr. Packard, and Comstock's *Introduction* were mentioned as the most available.

Mr. S. H. Scudder read from a letter of Mr. James Fletcher an account of damage done to the pine staves of the water pipes of the Ottawa (Can.) water system. The pipes have been in use fifteen years. The destruction is supposed to be due first to the decaying of a very thin layer of the surface of the wood through the chemical action of river water, and then to the removal of the decayed surface by aquatic beetles. Beetles belonging to *Dryops* and *Macronychus* were found in the injured wood; also larvae provisionally referred to the same genera.

Mr. Scudder read an account of the habits of spiders, by Jonathan Edwards, written in the last century, and recently published in the *Andover Review*.

Mr. Scudder also read a letter from Mr. E. A. Smyth, Jr., giving his observations on the habits and relative abundance of several *Coliads* found in North and South Carolina. (See *Psyche*, v. 5, p. 334.)

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PSYCHE.

SOME OLD CORRESPONDENCE BETWEEN HARRIS, SAY AND PICKERING.—III.

[HARRIS TO SAY.]

MILTON (Mass.) Nov'r 18, 1824.

To Thomas Say, Esq.

Dear Sir,

I have waited until this for a private conveyance of the box of insects which accompanies this letter.

The numbers of your Journal which I have received have afforded me much gratification, particularly the papers by yourself and those by Mr. Charles Bonaparte. From your descriptions I have already recognized several of my insects, & probably shall more when I can find leisure to examine them. The last number of the Journal wh. I have received is that for August; & I shall be glad to have any numbers that have since appeared sent me by the gentleman to whom I have entrusted this letter & box. I have requested Mr. Fuller to procure for me the first volume of your American Entomology, from which I anticipate much information & pleasure. If the work is published by subscription I should be happy to use my endeavours to procure subscribers for you.

I am completely at a loss for the description of that *weevil* which, in your letter of the 26th May, you call the

pinastri of Fabricius. The same specific name occurs in Melsheimer's catalogue; but I find no species by that name in the works of Fabricius which I possess: These are his *Entomologia Systematica*, 5 vols. 1792-1798; & his *Systema Eleutheratorum*, *S. Rhynogorum*, *S. Piezatorum*, & *S. Antliatorum*, 5 vols. 1801-1805. Neither does the specific name *pinastri* occur in *Gmelin's Linné*.

Curculio Nenuphar Herbst I do not find in Fabr. or Gmelin, & have not access to the work of Herbst.

I must thank you to refer me to the number of the Journal Acad. Nat. Sc. in which your description of *Stenocorus tridens* is to be found.

Last September I was so fortunate as to discover the male of that species of *Aegeria* of which I sent you the female in the spring, & to wh. I gave the name of *fulvicornis*, in a former letter. After repeating my definition of the species I will, agreeably to your request, add the characters of the male. *Aegeria (fulvicornis)* brunnea, alis posticis hyalinis; margine postico, stigmataque costali fuliginoso; antennis tarsisque fulvis, abdomine barbato. Mas minor, alis anticis basi hyalinis, apice opacis; ant. tribarbato, barba media perlonga, fulva. The most remarkable characteristic of

the male is the extremely long, slender, bearded appendage to the abdomen, of a tawny or dirty yellow colour. The whole length of the male from the head to the extremity of this appendage is $\frac{1}{8}$ of an inch; this appendage is not quite $\frac{1}{8}$ of an inch; being nearly as long as the whole body. Standing obliquely on each side of the anus is a little fuliginous tuft. The abdomen is somewhat fulvous beneath. The anterior & intermediate extremities are fulvous, the latter however have a dark patch on the genicula & tibiae. The first joint of the posterior tarsus is much more pilose than in the female; the hair near the union of the tarsus & tibia is fuliginous, the remainder fulvous. The *pectinations* of the antennae are slightly fuscous. This is the only male that I have ever seen, & I found it on the identical currant bush from which I had the preceding year taken the females.

I have this season met with a species of *Cicindela* that is new to me, & which I cannot identify as any one of those described by you in the Trans. Am. Philos. Soc. Phila. 1818. I have called it *Cicindela (erythrogaster)** obscure fusca, elytris lunulis basi et apicis, fascia intermedia flexuosa, punctisque duobus albidis: abdomine femoribusque viridis; ano late rufo. Length half an inch. Antennae green at base. Head cupreous, with two green abbreviated lines between the eyes. Mandibles white at the base, black at the points. Lip white, with a single tooth. Thorax cupreous obscure, with the margin & breast green. Elytra obs[c]ure, some-

what cupreous, with a humeral & terminal lunule, an intermediate flexuous band, & two spots behind the band whitish. Abdomen green, the hypogastrium red. Feet obscure, thighs green. I have only met with one specimen, which was captured in a dry, gravelly pasture.

Prof. Peck taught me to define the species in Latin & I have generally adhered to his advice, though it savours somewhat of pedantry.

My friend, Mr. Fuller, has kindly taken charge of a package containing two boxes of insects for you. In box 1, (the bottom one) are some of the Coleoptera which I have collected. They are all numbered in order to facilitate you in naming to me such as have been described, & to enable you to indicate the nondescripts. I have kept a catalogue to correspond, with arbitrary names for all the species not as yet ascertained. From the want of books, plates, & access to other cabinets, but more than all, from the want of time to examine them I have made out but few of the species. These I have added, however, that I might from your information and experience, render myself *doubly* sure; & also that I might learn of you to what genera they are to be referred, according to the System of Dr. Leach in Brewster's Encyclop. I prefer on most accounts his system to that of Latreille in the Regne Animal of Cuvier. Should it however be inconvenient to you to follow the first, I must content myself with having the genera according to the second; with such synonyms as may be necessary. No. 1 of

*[See Harris, Entom. corresp., p. 2.]

the Coleoptera I once supposed to be *Cicindela trifasciata*, F.; but now think it must be you[r] *C. vulgaris*. No. 7 is probably *Brachinus fumans* F. No. 27 much resembles your *Buprestis divaricata*; but is evidently a distinct species, from the construction of the apex of the elytra. No. 37 is the luminous larva? of some *Lampyris*: it is very common in low grounds in Sept'r and Oct'r. Nos. 66, 67, 68, and 69 may perhaps be only sexual or other varieties of one species. The same may be true as to Nos. 136, 137, 138, and 139. No. 76 I take to be your *Melolontha pilosicollis*; No. 83 your *M. sericea*; & No. 86 your *Cetonia barbata*. No. 93, as was observed by Prof. Peck, differs somewhat from the European *Tenebrio molitor*. No. 98 is to be found in all stages within the legumes of *Baptisia* (*Sophora* L.) *tinctoria*, in the months of Aug't and Sept'r. No. 106 inhabits beneath the bark of the Plum-tree; No. 107 beneath that of the *Juniperus virginiana* and if they are not already described by some other name, should, according to a rule of Linnæus, bear for their specific designations the generic names of the trees which afford them sustenance. This rule I conceive to be of the highest importance; and it appears most proper to distinguish the species of insects by the names of the trees or plants on which they live, in every instance where it is practicable, or where the habitat is known.

Can you tell me where I am to look for the larva of No. 114, *Lamia torna-*

tor, F. & for that of No. 117? That of No. 116 inhabits the Lombardy poplar. Can No. 117 be *Stenocorus cyaneus*, F.? Dr. Leach has separated from the genus *Rhagium* some insects to which he has given the generic name of *Hargium*; the characters of which are, "*Thorax with a spine on each side; antennæ thickest in the middle.*" The type of this genus is *Rhagium indagator*, F. Now it seems to me that No. 117 might be referred to this genus. Please give me your opinion on the subject. No. 132 appears to be *Cassida aurichalcea*, F. but no mention is made, in the description of that species, of the small black spot on each elytron. I have written a paper on this insect for my friend Hon'l John Lowell. No. 149 is extremely common on the *Tilia americana*, & the English Elm.

In the second box No. 1 is a complete *scare-sleep*, and from its note is called "*Katy-did.*" No. 20, *Sigara* — swims in the ordinary way, & not upon its back. No. 21, *Membracis bimaculatus*? F. is found in abundance on the *Robinia pseudacacia* in September. You may have observed the knotted condition of the small twigs of this tree. Each protuberance contains in summer a reddish worm, the larva of some insect, which lives on the pith, & leaves the tree to go through its metamorphosis, *probably in the ground*. May it not be the larva of this species of *Membracis*. Do you know the oeconomy of No. 33? I have ascertained the metamorphosis of Nos. 34, 35, 36, 44,

45, 46, 47, 48, 49, & 50. The history of some of them, particularly the 5 or 6 last, is interesting to the agriculturist, etc. On the cover are 3 more Lepidoptera, with whose changes I have made myself acquainted; & wish to be sure that I have ascertained the species. No. 129 I take to be *Papilio Troilus*, F., No. 130 *P. asterias*, F., & No. 131 *P. cardui*, F. All three were raised from the young larvæ. No. 75 is the parasite of *Papilio Asterias*. I have sent but few specimens of the Order Lepidoptera, because they are large, and occupy too much room.

Do you know the larva of *Papilio Hyale*? & its habitat? Of Diptera the box contains but 3 species. The *Myopa* & *Asilus* are curious from their resemblance of Hymenopterous insects.

On the cover are a few shells, obtained from a pond of stagnant (fresh) water. These & some from our beach which I picked up last summer are not sent as curiosities, but to convince you of my desire to comply with your wishes, as far as it is in my power.

If you have no use for the insects I shall esteem it a great favour to obtain, through your means, an exchange of specimens with any collectors in your vicinity. You have several insects which are desiderata, e. g. *Cremastocheilus castaneæ* Knoch., *Geotrupes Tityus*, F.; *Bolitophagus cornutus*; *Brentus anchorago*, & other species of the same genus; *Rhagium inquisitor*, F.; *Elaphrus riparius*; *Tipula tritici*; &c., &c. I have not yet found native species of *Blaps*; but very few of

Dytiscus, of which No. 23 in Box 1 is the largest; & but one small *Hydrophilus*. Those insects which I have sent are such as are the most common here: you can thence form some idea of what my collection must consist.

I am desirous to know whether *Xenos Peckii* is common with you; & whether you have discovered any other species either of *Xenos* or *Stylops*. I could in summer obtain any number of *Xenos Peckii*, but do not know how to prepare them for the Cabinet.

I will now bring this long letter to a close, hoping that you will excuse me if I have trespassed on your time and patience; for I am like a traveller in a strange land, anxious to obtain information, & the best of guides.

Be pleased, Sir, to accept the best wishes & grateful acknowledgements of

Yours, very respectfully,

T. WILLIAM HARRIS.

[DRAFT OF REPLY BY THOMAS SAY.]

JAN'y 8th, 1825.

Dear Sir!

Your interesting letter with the boxes of fine insects came to hand in excellent order by Mr. Fuller, at whose lodging I called several times, but probably owing to his engagements, I saw only once for a few minutes.

With respect to the *pinastri* I think it highly probable that I have adopted the name from Melsheimers Catalogue without examination since I do not find the insect desc'd in my Mss. Since the reception of y'r letter, I have looked

for it in vain in Fabr. & Herbst. Prof. Peck's name may therefore probably be retained.

Although much of Herbst's great work was publ'd long before the Syst. Eleut. yet it contains a great many desc's not noticed by Fabr.

I am very happy to find that I have not publ'd the *Stenocorus tridens*; after much search I discovered the desc'n of the insect amongst my rejected Mss. with the following note subscribed "It is probable that this is the *villosus* Fabr. as it agrees very well with his short desc'n." I do not think I have seen any insect that agrees better with the *bidens* Fabr. than this species, but he attributes to that sp. 2 spines to the extremity of each joint of the antennæ. It may be different from both, in which case Prof. Peck's name of *putator* must of course be retained.

Your *Ægeria fulvicornis*, is, I think new; it is certainly a charming and curious insect. I cannot determine whether the *Cicindela* be new or only a variety, but I am inclined to the opinion that it is new. I have no unpublished description of a *Cicindela*.

I agree with you perfectly with respect to latin specific definitions; I do not see the necessity of thus using that language in preference to the French, German or English languages, for I believe that almost every naturalist of

any distinction can read a description in either. If any part is to be latinized I conceive it ought to be the history which is always the most difficult to read in a foreign language.

The following is a list of the insects contained in the first box, carefully compared with descriptions of authors, with my Mss. descr's & with the specimens in my cabinet. [The list is not given.] The contents of the second box I have not yet had time to examine & compare, but I will attend to them as early as possible.

A new genus has recently been made by Dejean for the *Stenocorus cyaneus* Fabr. under the name of *Desmocerus*. It could not be referred to the g's *Hargium* of Leach, which is not adopted by subsequent writers.

I regret my inability to give you any information relative to the larvæ you mention, my opportunity of becoming acquainted with the changes of insects is at present very limited.

You mention having sent some Marine shells, but I have only received those that are attached to the lid of one of the boxes, & they are all fresh water; I therefore suppose that there was a package that I have, unfortunately, not received.

Xenos peckii is common here; but I have not seen any other species of the genus or of *Stylops*.

HEMARIS DIFFINIS: FROM LARVAE SENT FROM MISSOURI.

BY IDA M. ELIOT AND CAROLINE G. SOULE.

May 30. The larvae arrived and were moulting for the second time.

Length 5-8 inch. Head pale green, round, with a deep median suture, and three glaucous spots on the sutures; granulated with white. Body pale green dorsally, darker on the sides; venter with three brown longitudinal lines; thickly granulated with white. 1st segment crowned with a transverse, double row of bright yellow, raised granules, which projected over the head, giving it a retracted look. This segment was bluer green than the others. Feet and props almost white barred with dark brown. Caudal horn long, slender, rough, bright yellow at the sides of the base, blue-black elsewhere. Anal shield slightly yellow at tip. Spiracles deep blue black, ringed with pale blue. No obliques.

June 2, 3d moult.—Length 1 1-8 inches. Head clear blue-green, granulated with white. Mouth-parts blue-black. Body: 1st segment blue-green, crowned with transverse, double row of yellow granules, depressed on dorsal line. Other segments white-green dorsally, very yellow-green laterally, and with the venter red-brown, with two longitudinal stripes of dark brown which included the base of props and feet. The body was thickly granulated with white, yellower on the sides. Feet and props brown, barred with darker brown. Caudal horn long, slender, straight, sharp, rough, bright yellow at sides of base, blue-black elsewhere. Anal shield with a faint yellow tip. Spiracles deep blue-black, with a white dot in the black at top and bottom; a pale blue ring encircled the whole. No obliques.

June 9, 4th moult.—Like the third, except in size. Length, 1 1-2 to 1 3-4 inches, varying in individuals.

June 13. Stopped eating, and the dorsum and head turned almost purple. Spun light cocoons, fastening leaves to the tin.

June 16. Pupated.

Pupa 1 1-8 inches long, smooth, slender, with the head very pointed, and anal tip very short and rough. In some specimens the tongue-case was hardly to be seen, in others was a flat ridge extending just beyond the apex of the wings. In color the pupae were of a dark brown, much lighter between the segments, and almost black on the head, thorax and wings.

They were the most active pupae we have ever seen. One pupa had not given the imago up to Aug. 8, 1891, although very lively, rolling from one end of the box to the other whenever the box was jarred.

The larvae had been fed on *Symphoricarpus racemosus* until they reached us, but ate *Lonicera tartarica* and *L. japonica*, and were fed chiefly on the former.

They had one unusual peculiarity: The slender part of the caudal horn was easily rubbed off, more than half the larvae losing it at some stage, and regaining it at the next moult, or losing it entirely during the stage before pupation.

The first moth, ♂, emerged July 4, a second ♂ emerged July 6, and a ♀ somewhat later in the day, but before noon.

There were no signs of mating until the box was put into strong sunlight, when in less than five minutes the pair were *in coitu*, and so remained for about two hours.

Our moths differed somewhat from those described by Mr. Fernald in his "Sphingidae of New England."

The ♂ had the top of the head, thorax, and first two abdominal segments of a bright green—almost parrot-green—the dorsal line being a trifle browner, and the sides of the abdominal segments a little yellower. The next two segments of the abdomen were almost orange, the second browner on the dorsum, and the first having a brown dorsal line. Both these segments were edged posteriorly with dark brown. The rest of the abdomen was dark brown, and ended in heavy anal tufts, those on the sides being black, that in the middle yellow-brown. On the sides of the first two abdominal segments, and on the dorsum of the second were small tufts of blue hairs. The upper part of the palpi, the sides of the thorax, the legs and the underpart of the abdomen were black. The under part of the palpi, the first joint of forelegs, and the sides of the thorax just beneath the base of the wings were bright canary yellow, as was a spot between the second pair of legs. On the yellow abdominal segments there was a broad black ventral band.

When freshly emerged the transparent parts of the wings were covered with black scales thickly enough to look almost as opaque as the dark border, but these scales quickly rubbed off as the moths moved about. The forewings had a brown costal band, a much wider band on the outer margin, with a rust-colored spot near the apex and a brown patch at the base of the wings, continuing as a band along the hinder edge. Veins dark brown. When freshly emerged there was a patch of green hairs overlapping the base of

the wings, but these soon rubbed off. The hind wings were edged with rusty brown, the band being widest on the inner border. Veins rusty brown. All these brown bands were opaque, and the transparent parts of the wings were iridescent in the light. Legs black, iridescent in the light. Antennae wide, club shaped, with a little spine at the apex, rusty black, serrate on the two edges.

The ♀ differed in having no blue tufts on the abdomen; smaller antennae, which were not at all serrate; smaller anal tufts; and yellow, instead of orange, on the abdominal segments. The brown dorsal line on these segments was wider than on those of the ♂.

The moths were very quiet unless put into the sunlight when they at once began to fly about almost incessantly. Sugar and water were put on the netting over the box, but I am not sure that they fed at all.

The ♀ began to lay her eggs at about 9.30 A.M., July 7th. The eggs were small, oval, bright green. Sixty eggs were laid the first day, and became slightly depressed on the next day. The moth would lay fifteen or twenty eggs, making a great noise and fuss over them, and then would seem exhausted, and rest for a long time before laying more.

Sixty-one eggs were laid on the second day. Forty-three eggs were laid on the third day. Forty-four were laid on the fourth day and the ♀ died before noon, having laid 208 eggs. July 14, at 1 P.M., the eggs began to hatch, having turned yellow two days before.

Young larva 1-8 inch long, pale yellow, tapering from the large, round head to the

anal segment. The body was covered with short white—or colorless—hairs, and the feet and props were of the body color. The mouth-parts were pink; the anterior edge of the first segment overlapped the head, and was whiter than the head or the body. The caudal horn was yellow at first, then gray, then black. It was straight, stout, blunt and rather long in proportion to the body. It had one hair arising from its tip. There was a substigmatal ridge, whiter than the body, from head to tip of anal shield.

The larvae did not eat any part of the eggshell, but at once went to the leaves provided for them and began to eat. This is unusual in our experience of newly-hatched larvae, most kinds not beginning to feed until at least twelve hours from the egg, though they all drink greedily. After eating the larvae became glassy green, with yellow head, anal segment, feet, props, and substigmatal ridge.

July 17. *1st moult*.—1.4 inch long. Head small, yellow. Body above green, covered with short hairs seen only with a lens; beneath almost purple. First segment with a dorsal crest of yellow granules depressed on dorsal line. Caudal horn blue-black, long, slender, rough, yellow at sides of base. Feet, props, and spiracles blue-black.

July 20. *2d moult*.—Length 1.2 inch+. Head green. First segment greener than the others, and crested as before, both head and 1st segment being granulated with white. Substigmatal ridge yellower. All else as before.

July 23. *3d moult*.—1.8 inches in length. Head and 1st segment greener than the rest of body and of a blue-green. Body finely granulated with white. Dorsum very white-green; sides very yellow-green; venter almost black. Feet, props, and spiracles blue-black, the latter set in rings of pale

blue. Caudal horn as before. Crest on 1st segment as before.

Nine larvae came out of a clear, soft chocolate brown, with the first segment browner, and crested with yellow granules; the base of the caudal horn yellow on its sides; spiracles, feet, and props blue-black. There was no difference of color between dorsum and sides, as in the green larvae. They were as vigorous and ate as voraciously as the green ones. One was yellow on dorsum and brown elsewhere.

Two others were pale brown on dorsum, dark brown on sides, and had black heads. The substigmatal ridge was lost at this moult.

July 27. *4th moult*.—Head as before. Venter red-brown with a dark stripe on each side, in which the feet and props were set. Dorsum and sides as before. Feet nearly black with a white bar across the outer side. Props brown barred with darker brown. Spiracles blue-black, each with a white dot *in the black* at each end, and set in a ring of pale blue. Horn as before.

They varied somewhat in the ventral marks, some having the tan-colored median stripe extend from head to anal props, others from 5th segment to anal props, the first five segments being almost black.

The dark larvae came out with the head black, not shining. Body deep chocolate brown granulated with white, and lighter on the dorsum. First segment and anal shield and props bright orange granulated with yellow. Feet and props dark brown. Venter tan-colored, with an almost black stripe on each side. Horn yellow at the sides of its base, blue-black the rest of the way, and rough.

August 2d they measured from 1.3-4 to 2 inches in length, and the first ones

turned purplish on head and dorsum, stopped eating, and began wandering about the tin for a place to spin. The brown ones turned duller in color.

Aug. 3. They had spun slight cocoons.

Aug. 7. They pupated.

This account gives the dates of moults, spinning and pupation of the larvae first hatched. The others were later in all their changes, and the last hatched did not grow so large or so rapidly as the first.

These larvae were very voracious, and ate even the berries of the *Lonicera* and the stems down to the woody twig. They required food-supply three times

a day, after the fourth moult, although the tins were large and but thirteen larvae were kept in one tin.

They were very placid, slow, easy-going larvae, bore any amount of handling, and were crawled over by each other without any of the petulant twitching and biting always shown, under such circumstances, by larvae of *juglandis*, *astylus*, *abbottii*, and other Sphingidae.

Out of the 120 larvae we undertook to rear only two died, and those two were from the last eggs laid and died in moulting.

BROOKLINE, MASS. Aug. 8, 1891.

NOTES ON BOMBYCID LARVAE.—II.

BY HARRISON G. DYAR, NEW YORK, N. Y.

ORGYIA DEFINITA Packard. (For references, see above, p. 111; to which add:) 1890. Leifert, 5th rep. U. S. ent. comm. p. 561.

First larval stage. Head pale testaceous, darker on the vertex; ocelli black, mouth brown; width 0.5 mm. Body pale whitish, the subdorsal warts on joint 2 larger than the rest, the dorsal warts blackish. Hair long, pale whitish. There are no pencils nor brush-tufts of hair and no retractile tubercles on joints 10 and 11. As the stage advances all the warts become dark.

TORTRICIDIA FLAVULA Herrich-Schaffer.

1854. Herr.-Sch., Sam. ausser. schmett., fig. 185.

Mature larva. By its shape allied to the larva of *Lithacodes fasciola* H.-S. Head retracted beneath joint 2, which is in turn re-

tracted beneath joint 3; greenish testaceous, mouth parts brown, ocelli black. Body elliptical, the sides sloping from a slight subdorsal ridge, and contracted between joints 12 and 13, giving the last segment a square appearance. Bright green, the dorsum largely covered by a patch of salmon color or purple brown bordered with a crimson line and a yellow shade. It begins somewhat broadly above the head on joint 3, narrows at once to a dorsal band on joints 4 and 5, widens twice, the second time passing down to the subventral edge of the body at joint 8, then narrows twice (this part of the outline varies in different examples), and tapers to a point at the anal extremity. The body is covered very minutely with translucent granulations, the usual elliptical depressions hardly distinct, smooth, whitish in the dorsal patch, and containing a dorsal and lateral row of blackish spots. Length 9 mm.

The cocoon and pupa do not differ from those of all the other Cochliidae.

Food plants. Deciduous trees.

I have bred from these larvae four moths which are alike, and correspond with Herrich-Schäffer's figure. Under a glass there can be distinguished a few brown scales representing the usual lines. In the Elliot collection, now in the American Museum of Natural History, is a fine series of a *Tortricidia* which represents both *T. flavula* and *T. pallida*, with a number of examples that appear to connect the two. In *T. pallida* the lines are present very much as in *Limacodes flexuosa* Grt.,* but the inner one is somewhat curved as Herrich-Schäffer figures it. *T. pallida* can be distinguished from *L. flexuosa* by the pale, flesh-color shading that is seen to overspread the basal half of primaries in certain lights, while in *L. flexuosa* the wings are uniformly ochreous. The two species are closely related however.

APATELODES TORREFACTA Abbot & Smith.

1797. A. & S., Lep. Ins. Ga., tab. 76.

1889. Soule, Psyche, V, 148.

1890. Packard, Proc. Bost. soc. nat. hist. XXIV, 519.

More observations are needed to determine the number of larval stages of this species. Miss Soule finds five stages, and Dr. Packard has recorded six, but it is almost certain that both have found too few, and, as no measurements of the head are given, it is impossible to tell where the error is.

I obtained the larva on July 30, apparently about half grown. It molted four times, and the measurements of the head for the five stages which I observed were as follows:—

1.3 mm., 1.6 mm., 2.1 mm., 2.6 mm., 3.2 mm.

These correspond very well with the series derived with the ratio .80 by calculation from the last stage. But, if there are only six stages, the newly-hatched larva would have

* I have elsewhere called attention to the probable synonymy of this species.

a head 1.05 mm. wide, which would be very unusual for a larva as small as this. Of the species which I have recorded in Psyche, vol. 5, p. 420, *et seq.*, the only larva hatching with a head this size is *Platysamia cecropia*, which is, of course, a very much larger insect. If we calculate the series further back, say to ten terms, we have the following result:—

0.42, 0.53, 0.66, 0.83, 1.05, 1.31, 1.64, 2.05, 2.56, 3.20.

In my opinion, 0.83 mm. or 0.66 mm. would be about right for this larva in the first stage, and hence I conclude *Apateles torrefacta* has as many as seven or eight stages.*

I shall be much interested to have this verified or disproved, which can be easily done by any one who can determine the width of the head of the newly-hatched larva from a living or an alcoholic specimen.

GLUPHISIA TRILINEATA Packard.

1864. Pack., Proc. ent. soc. Phil., III, 355.

1883. Edwards & Elliot, Papilio, III, 129.

The larva of this species has been briefly described in its last stage by Edwards & Elliott. It is not uncommon on poplar in Dutchess and Ulster counties, N. Y., often associated with *Raphia frater*, which it much resembles in general structure, though it is more slender. It is unusually plainly marked and inconspicuous for a Ptilodontid larva; the anal feet are used for walking, and the body is smooth, without tubercles or processes. The eggs are shaped like the upper third of a sphere, flat on the under side. Their color is pale yellowish green, very minutely and densely punctured. Diameter about 0.9 mm. They are probably laid singly.

I believe there are five larval stages, though I have not observed the first. The second, third and fourth are so much like the fifth

* If the width of the newly hatched larva is about one half the width of the egg, as seems in general to be the case, then 0.66 mm. would be right and the species would have eight stages.

as described by Edwards & Elliot, that I will not re-describe them. When young the larvae each rest on a little web on the under side of a leaf, the head held out quite flat. The mature larva is thickest at joint 9, and tapers slightly to the extremities. Beside the yellow subdorsal band mentioned by the describers there is a fainter white substigmatal one on joints 2-4.

The widths of head for the five stages, calculated and actually found, are as follows:—

Calculated.—0.48, 0.74, 1.14, 1.75, 2.7 mm.
Ratio, 0.65.

Found.—0.7, 1.2, 1.7, 2.7 mm.

The cocoon is formed of few threads, at the ground. The pupa is very dark brown, almost black; flattened on the ventral side, the dorsum evenly rounded; finely punctured. The abdominal segments are closely appressed, motionless; cremaster none, anal segments evenly rounded. Length 10 mm., width 4.5 mm.

There are two broods each year, and the winter is passed in the pupal stage.

EDEMA ALBICOSTA Hübner.†

Hübner, Noct. 440.

Herr-Sch., Syst. bearb. sch. Eur. fig. 131.
1871. Staudinger, Cat. Lep. Europ. (Note.)

This larva has not such an abnormal development as I have supposed. I have recalculated the series for the widths of head, and find the following much better than the one I gave in *Psyche*, v. 5, p. 421, viz.:—

Calculated.—0.61, 0.85, 1.19, 1.66, 2.30, 3.2.
Ratio, .72.

Found.—0.4, 0.7, 1.3, 1.7, 2.3, 3.2 mm.

This fits the observed facts except in regard to the first two stages, and I may have measured them too small. All the measurements were taken from living larvae, and hence are liable to some discrepancy.

The species has six larval stages, which is abnormal among the Ptilodontes if we except *Ichthyura inclusa*,‡ which seems to have also six stages, and the species of *Apatelodes* and *Nadata*, which probably have even more.

THE NEW CATALOGUE OF EUROPEAN COLEOPTERA.*

This is in every way the most elaborate and important edition (No. iv) of the Catalogue of the European Coleoptera yet published. It is on a somewhat new plan. The family arrangement is that usually followed in Europe. The sequence of the genera and species is that adopted by some monogra-

pher of the family, or genus, usually the latest, reference to whose work is made under the title. The name of the species, with the principal synonyms, and the authorities for their creation, with other useful bibliographical references follow, as well as indications of geographical distribution within the faunal limits laid down. In the preface it is stated that the work was parcelled out to Mr. L. Ganglbauer, Dr. L. v. Heyden, Dr.

* *Catalogus Coleopterorum Europae, Caucasi et Armeniae Rossicae*. Edited by Edmund Reitter. Berlin, Mödling, Caen. 1891.

† I have erroneously referred to this species in *Psyche*, v. 5, p. 421, as *E. albifrons* S. & A. All the specimens which have occurred to me at Rhinebeck, N. Y., have been *E. albicosta*, as I have recently discovered. The species may readily be separated by the character of the projecting tooth of the white costal

band, which in *albifrons* is regularly rounded, but in *albicosta* is sharply pointed or dentate. I strongly suspect that the larvae described by Mr. Beutenmüller in *Ent. Amer.* vol. 6, p. 75, and by Dr. Packard in *Proc. Bost. soc. nat. hist.* vol. 24, p. 525, as *E. albifrons*, are really those of *E. albicosta*.

‡ Prof. French finds six stages for *I. palla* (= *inclusa*) in *Can. ent.*, v. 17, p. 42, and I have measurements which, as far as they go, corroborate him.

Ed. Eppelsheim, Mr. Edmund Reitter, and Mr. J. Weise, each of whom is responsible only for his own part, which is designated.

In comparing it with the third edition of 1883, a vast number of changes in specific names is notable, and many long familiar ones have been relegated to synonymy. Antiquity seems to have been extensively ransacked, and many entombed names have been stripped of their cerements and brought to the light. How science is to be benefited by all this is not evident, but if it has to be done, the quicker the better. Had the code of nomenclature adopted by the British association in 1842 and again in 1865, and by the Association of American geologists and naturalists in 1845, making the XII edition of the *Systema naturae* (1766) of Linnaeus the limit of time from beyond which no name could be advanced, and according to which the specific names in both the European and American catalogues were first recorded, much of this confusion could have been avoided. But this being set aside, every one is free to do as he pleases, and frequently the brief and imperfect descriptions of the ante-Linnaean are made to apply in an imaginary way to insects common and long known by other names, which are at once dropped, and the semi-imaginary ones substituted, to the intense disgust of many who fail to perceive how science is to be benefited. It is not beyond hope that in time a limit in this direction may be reached. A fire goes out when the fuel is all consumed.

This catalogue is of some interest to American coleopterists, as it advances many new names for species common to the two hemispheres, as for example: Our abundant *Philonthus aeneus* must hereafter be called *politus* Linn., and our *politus*, *fuscipennis* Mann.; *Orphilus glabratus*, a world-wide name, must be replaced by *niger* Rossi; *Nitidula bipustulata*, by *bipunctata* Linn.; *Xestobium rufo-villosum* DeG., is to supersede *tessellatum*; and the imported elm-leaf beetle, *Galeruca xanthomelaena* becomes

luteola Mull, etc. Justice has been done Mr. Say in placing his *Phylethrus bifasciatus* in the catalogue, but injustice in advancing *Bruchus irresectus* Fahr. over his *obsoletus*.

It evidently requires immense labor, research, much entomological knowledge, and calm, unblased judgment to produce a satisfactory work of this kind, and it can scarcely be doubted the authors have fairly succeeded.

JOHN HAMILTON.

TEMPERATURE EXPERIMENTS WITH MOTHS.

The Transactions of the Entomological society of London for 1891, Part i, give some recent experiments made by Mr. F. Merrifield on two double-brooded species of *Selenia*. We extract the following general conclusions.

1. That both the marking and the coloring of the perfect insect may be materially affected by the temperature to which the pupa is exposed.

2. That the *markings* are chiefly affected by long-continued exposure, probably previous to the time when the insect has begun to go through the changes between the central inactive stage and emergence.

3. That the *coloring* is chiefly affected during the penultimate pupal stage, i. e., before the coloring of the imago begins to show.

4. That a low temperature during this penultimate state causes darkness, a high temperature during the same period having the opposite effect.

5. That, in the species operated on, a difference between 80° and 75° is sufficient to produce the extreme variation in darkness caused by temperature, a further lowering of the temperature having no further effect on it. . . .

6. That in these species dryness or moisture during the pupal period, whether during a low temperature or a high one, has little or no effect on the coloring of the imago. . . .

The results obtained appear also to indicate that probably some local climatic varieties, and even seasonal varieties, may be found to be, in part at least, temperature forms of the individual; and, looked at from this point of view they appear to me to lend some support to Lord Walsingham's theory as to the advantages derived by an insect in a cold region from being of a dark color, for they show that, if that is an advantage, it is one that can be acquired, not only by a race for use in a cold locality, but by individuals for use in a cold season. I think it is quite clear that if a cool week supervened in southern England between the beginning and the middle of July, or a hot week in the middle of April, at either of which times many of the pupae of *illustraria* would be in what I have called the penultimate pupal stage, most of these insects which it found in that stage would have their coloring affected. It would appear that even two or three hot days, if they came exactly at the right period, would be enough for the purpose; and I need hardly observe that it is very unlikely that these are the only species that would be so affected.

There is another general suggestion which I venture to make in concluding. If Prof. Weismann's theory is accepted, that the existing forms of most European and some North American Lepidoptera have come to us from a glacial period or climate, and that icing the pupa causes the insect to "throw back" to its earlier form, then experiments of the kind tried on the pupae might assist us in tracing the evolution of the markings on the wings of some of the most highly developed forms.

In a postscript he adds:—

I am now able to add that the coloring of the spring emergence of *illustraria* is as much, or nearly as much, affected by temperature during the penultimate pupal period as is that of the summer emergence. This has been established in case of three different broods, portions of each having been subjected to temperatures of 60° and 80° respectively; the

latter often in coloring very closely approach the light chestnut-orange summer type. This is interesting in reference to Prof. Weismann's theory, that in cases of this kind, the moth from the summer pupa can be caused to resemble that from the winter pupa, but not *vice versa*, as it shows that *either form* is equally ready, on the suitable temperature stimulus being applied, to assume the characteristic appearance of the other, *so far as coloring is concerned*. In other respects my observations are in accord with that theory. Thus, I have never been able to cause the moth from the winter pupa to take the *markings* proper to the moth from the summer pupa, whereas the moth from the summer pupa can be made in markings to resemble almost exactly that from the winter pupa; nor have I been able to cause the moth from the winter pupa to emerge in a period approaching in brevity that of the summer pupa; indeed, in the great majority of cases, the early and continued exposure of the winter pupa to a temperature of 80°, or even 60°, caused its death.

SOME ABNORMAL LARVAE.—One larva of *Thyreus abbotii* had a single, thick, stiff hairlike bristle, arising from the tip of the caudal tubercle, all through the third moult, the second and fourth moults being normal. Another larva of *T. abbotii* kept the whitish green coloring of the early moults until it pupated, the only change of marking being a vague lateral line slightly darker than the body, and the usual changes of anal tubercle.

Caroline G. Soule.

ANOTHER DEIDAMIA INSCRIPTA.—On July 13th on *Ampelopsis veitchii*, I found a larva so like *Everyx myron* that I put it away as such, though it had no purplish spots on the back. It differed from last year's specimen in having faint yellow obliques, and in having the yellow lines from the head extending nearly to the eleventh segment. The pupa, formed on July 17th, was like that of last year, except that it lacked the spur near the

tip of the anal hook, and was slightly larger, especially around the abdomen. The dates of finding this larva and of its pupation were the same with that of last year, and the place was within a foot of the spot where last year's larva was found! *Caroline G. Soule.*

MISCELLANEOUS NOTES. — With the methodical precision which marks the work of the entomologists of the Austrian capital, Redtenbacher, in the 2d part of the *Verhandlungen* of the zoological-botanical society of Vienna for 1891, gives a monograph of the locustarian subfamily *Conocephalinae* which extends to nearly 250 pp. and is accompanied by two excellent folding plates. Redtenbacher divides the group into four tribes: *Conocephalini* with 25 genera and 166 species (3 genera and 12 species from the United States); *Agroeciini* with 30 genera and 94 species; *Xiphidiini* with 3 genera and 68 species (1 genus and 17 species from the United States); and *Listroscelini* with 6 genera and 35 species. *Conocephalus* alone has 101 species and *Xiphidium* (including *Orchelimum*, separated only as a subgenus) 66 species; the only United States species not contained in *Conocephalus* (7 sp.) and *Xiphidium* (17 sp.) are *Belocephalus subapterus* Scudd. and *Pyrgocorypha uncinata* (*Conocephalus uncinatus* Harr.).

At the July meeting of the Entomological society of London, it was stated by Dr. T. A. Chapman, an excellent observer, that the larva of *Micropteryx*, one of the lower Lepidoptera, possesses on each of the eight abdominal segments "a pair of minute jointed legs of the same type as the thoracic. There are also a pair of long jointed antennae."

To an interesting and very thorough description of an hermaphroditic spider, Bertkau appends a catalogue of recent cases and states that 361 hermaphroditic Arthropoda are now known, of which 9 are Crustacea, 3 Arachnida, and 349 insects, divided as follows: 2 Orthoptera, 11 Diptera, 267 Lepidoptera, 59 Hymenoptera, and 10 Coleop-

tera. In 165 cases where the separation is lateral, 85 are males on the right side, 71 on the left, leaving 9 uncertain.

PROCEEDINGS OF SOCIETIES.

CAMBRIDGE ENTOMOLOGICAL CLUB.

14 March, 1890.—The 152d meeting was held at 156 Brattle St. Mr. S. Henshaw was chosen chairman.

Mr. S. H. Scudder exhibited illustrations showing the work done by beetles in the staves of the Ottawa water works, described in a letter from Mr. James Fletcher, read at the last meeting.

Mr. Scudder stated that he had completed his work on Fossil insects of the West, planned for Hayden's Survey some fifteen years ago. It contains descriptions of some 612 species. He further showed a tintype of carboniferous cockroaches from the coal deposits of Rhode Island. They were nearly all of them collected near Silver Spring, a suburb of Providence.

11 April, 1890.—The 153d meeting of the Club was held at 156 Brattle St., Mr. S. Henshaw in the chair.

Mr. Henshaw read a letter from Mr. Ellison A. Smyth, Jr., on some southern Lepidoptera. In this article mention was made of the capture of two specimens of *Neonympha canthus* near Charleston, S. C. (See *Psyche*, 1890, v. 5, p. 348.) A short discussion followed on some of our spring butterflies.

Mr. S. H. Scudder exhibited specimens of some Gryllidae recently received from a correspondent in Spain, of the genus *Platyblemmus*, in which the front of the head is prolonged and dilated into a flat plate, resembling somewhat the clypeus of some Scarabaeidae.

Mr. Scudder recorded the occurrence of *Pteromalus* as parasitic on *Fasoniades glaucus*, *Euphrosades troilus*, *Papilio polyxenes*, and *Euphydryas phaeton*. He also read a letter from Mr. James Fletcher, in which was noted the occurrence of several specimens of *Erebia discoidalis* at Sudbury, Ont.

PSYCHE,

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PSYCHE.

CADDIS-WORMS OF STONY BROOK.

BY CORA H. CLARKE, JAMAICA PLAIN, MASS.

That part of Stony Brook in which I have made collections lies within the limits of the City of Boston. It is about eight feet wide, and its depth varies from two to twenty-four inches. In some places it flows slowly, in others rapidly; here the bottom is muddy, there pebbly. Fresh-water algae of several species, a great variety of other water plants, and many different animals are found in it; among the animals are fresh-water sponges, Polyzoa, planarians, mollusks, water insects of all kinds, and occasionally a fish, newt, or turtle. But the most interesting of all its inhabitants are the larvae of the Trichoptera or Caddis-worms. I have found in all about twenty distinct species, representing each of the seven families.

PHRYGANEIDAE. Of this family I have found only one representative, a species of *Neuronia*. Possibly it is *Neuronia stygipes*, but the only imago which I have succeeded in rearing was imperfect. It emerged from the aquarium on April 5th. The larva has a yellow face striped with black, and is very restless and nervous in its movements, continually travelling about the aquarium, making sad havoc among its inhabitants, eating dragon-fly larvae as large as itself, other caddis worms, and

indeed any insect which it can catch. It also devours raw beef with relish. The case of this larva (fig. 1*) is made of quadrangular pieces of leaves, fastened together by their edges and arranged in rings rather than in the spirals which M'Lachlan tells us is characteristic of the genus. Three or four or sometimes more of these rings, make the length of the case, which, when full-grown, may be 35 mm. long.† When the *Neuronia* larva is not satisfied with its case it bites off a ring at one end, replaces it with a freshly constructed ring, and then turns within the case, and does the same at the other end. If pushed out of its case, and deprived of it, it will make a new one in a night. Sometimes this species is tolerably abundant, and again for several years, it is quite scarce.

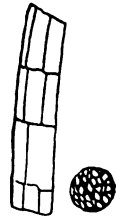


Fig. 1.

LIMNOPHILIDAE. I have found five or six species of this family. The commonest of these is *Hallesus maculipennis*, the larvae of which are very

* All the cuts are of the natural size excepting fig. 23 and the operculum in fig. 8.

† I have found that with most species of caddis-worms the case of the pupa or adult just before pupating is shorter than that of the growing larva.

abundant, crawling over the water plants in the brook. They can sometimes be seen under the ice in a submerged meadow. The cases (fig. 2) are made of little sticks and other vegetable bits, put on transversely, and those of the growing larva have a bristling appearance, probably similar to those Isaac Walton calls "Ruff-coats," but the case of the pupa is a smooth cylinder. At this time it is about 15 mm. long, and is closed with a net at each end, as is also the case of *Neuronia stygipes*. These nets or disks which close the apertures, are indicated on some of the cuts. The larvae frequent rather quiet water, and therefore are comparatively easy to keep alive in an aquarium, but all species need especial care during pupation, which is the critical period of a caddis-worm's life. I have found them pupating in the brook at the end of May.

A larva, which is probably that of *Limnophilus pudicus*, makes a slightly curved case (fig. 3) of little, rounded, imbricating bits of leaves. It is not very common, and I have never reared it.

The larvae of *Anabolia sordida* are nearly as abundant as those of *Hallus maculipennis*; their cases (fig. 4) are composed of bits of bark and little sticks, to which are sometimes added fragments of moss, a little

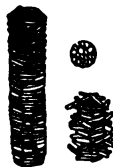


Fig. 2.



Fig. 3.



Fig. 4.

sand or gravel or a few shells. I have never found a case of any species composed entirely of shells. When sticks are used they are put on longitudinally, and usually project beyond the ends of the cylinder. During pupation each end is closed with a net or grating. I have found a larva pupating at the end of May and also in June. The adult case is about 24 mm. long.

I have found larvae similar to those of *Anabolia*, in cases made entirely of pieces of sedge leaves, arranged lengthwise with long projecting ends, but though I once reared the imago, which also resembles that of *Anabolia*, I have not succeeded in obtaining its name.

Another case of about the same size (fig. 5), with an imago resembling that of *Anabolia*, appears to be rare. It is made entirely of leaves, and in cross section is three angled, with projecting corners. This larva also is not unlike that of *Anabolia*.



Fig. 5.



Fig. 6.

A similar larva makes a case (fig. 6) of bark and sticks, about 20 mm. long but slightly flattened, with a little stick at each side, and imbricating bits of leaves between.

I sometimes find in the brook the larva of a species of *Stenophylax*. The case (fig. 7) is cylindrical, about 22 mm. long, and is made entirely of gravel. During pupation it is closed with a net at each end.



Fig. 7.

SERICOSTOMATIDAE. I have found six species of Sericostomatidae, of which the most interesting belong to *Helicopsyche*. Species of this genus make small, snail-like cases of sand, gravel or mud. The one whose case is figured (fig. 8) uses coarse sand. I find it crawling on stones or weeds where the current is rapid. In pupation the mouth of this snail case is closed with an operculum in which is a small eccentric slit. At the apex of the spiral, which represents the back door of the larva, there is a lacunose disk. These larvae were found pupating on June 2nd.



Fig. 8.

A species of *Brachycentrus* is sometimes common and sometimes scarce. It makes a quadrangular case (fig. 9) of a few square bits of bark, fastened together at their edges.



Fig. 9.

Once I found a number of empty cases (fig. 10) made of sand; they were small, club-shaped, and curved, and probably the makers belong in this family.



Fig. 10.

One of the most abundant species in Stony Brook (and in other brooks where I have collected) belongs "near *Mormonia* or *Trichostoma*."

The case (fig. 11) is arched on the back, and flat or slightly concave below, and is made of gravel, with small stones on each side, and is about 12 mm. long. I have found similar cases in Jamaica Pond. During pupation the cases are closed at each end with a small stone, but to insure a current of water through the case,



Fig. 11.

each of these little stones is attached to the case by a row of short threads, looking not unlike the teeth of a moss capsule. Fig. 12 shows their appearance at the ventral side of the head end, where is the point of attachment.



Fig. 12.

Even more abundant than this species is one which makes cylindrical, slightly curved tubes of sand, (fig. 13), which, when their inhabitants are pupating, often are found attached to each other in large masses.



Fig. 13.

At this time each end of the case is closed with a grain of gravel, and I cannot see what provision is made for the respiratory current. The larva, however, has a small hole at the side of the sand grain which serves to close the posterior end of his case. The case of the growing larva flares somewhat at the anterior end, but that of the adult is evenly cylindrical. I have an imago of this species which I reared from the egg, in the tranquil waters of my aquarium, but when the pupae are taken from the brook, they should be kept in running water to transform. On April 17th, 1890, I found multitudes of these cases in Stony Brook near the Mount Hope station. I supposed that the larvae had pupated, since both ends were closed, but keeping out of water for a few minutes one of the stones to which they were attached, most of the little larvae opened their front doors, and stretched far out to see what had become of the brook. By another month, however, they really had changed to pupae. Some of the imagos of this species,

which I reared in my aquarium, came out with a large tubercle on each side of the head. These tubercles are supposed to be organs of scent.

Another species of the same family makes a case (fig. 14) in shape so like the preceding that I at first confounded the two, but the larva of this latter species has a yellow head striped with black, while that of the former has a plain gray head. Moreover the yellow-faced one uses finer materials, and before pupation shuts itself in at each end with a disk, instead of a grain of gravel. One of the imago emerged on June 15th.

LEPTOCERIDAE. (MYSTACIDAE.) I have found in Stony Brook four species belonging to this family, and another in Jamaica Pond. This last species makes small cases, 9 mm. long, of little sticks, arranged transversely like those of Hallesus. The imago is a pretty little gray spotted creature, but I have not been able to ascertain its name.

But the prettiest of my Stony Brook Leptoceridae is colored a soft yellowish brown, and has very long slender antennae, which indeed are characteristic of the family. It is said to belong "near *Setodes ignita*." The larva is most abundant on the plants of *Callitriche verna* or "water starwort" from the leaves of which it usually makes its case. This (fig. 15) is a delicate tapering cone, about 20 mm. long, and the bits of leaf



Fig. 14.



Fig. 15.

are arranged side by side in a spiral, which in some individuals winds to the right, in others to the left. In a tube 21 mm. long, there were 11 turns to the spiral. The little larva protrudes its long slender legs from the case, and swims merrily about in the water. It pupates in June and July, and is easy to rear in confinement. The case of the pupa is about 10 mm. long, and is evenly cylindrical, each end being closed with a disk which has a small round hole in the centre.

The larva of *Mystacides nigra* also swims with freedom and is abundant both in Stony Brook and Jamaica Pond. Its little case (fig. 16), about 10 mm. long, varies much, both as to materials and their arrangement, but is chiefly composed of bits of bark, and little sticks, sometimes filled in with fine sand. It is easy to rear, and the little black imago may be recognized by a peculiar bend in each of the upper wings, which makes them look as if broken.



Fig. 16.

A species of *Molanna*, a genus considered one of the most interesting of those found in Great Britain, is often quite abundant on the sandy bottom of the brook, but I have never reared it, though it does well in an aquarium, until it pupates; it makes a flattened case (fig. 17), with an arched dorsal side, which projects far above the anterior end, so that nothing whatever is seen of the larva when it is crawling on the bottom. The appearance is as if some of the sand



Fig. 17.

grains were walking off in a mass. This protecting portico disappears during pupation.

A larva, which in some years is quite abundant, spins for itself a case of black silk, weighted with vegetable matter. It is about 15 mm. long, terete, tapering to the rear end, where there is a small hole. The cases of the young are quadrangular at the anterior end, which end during pupation is closed with a thick disk, having in its centre a thinner circular area perforated with holes.



Fig. 18.

In the illustration (fig. 18) the adult case is represented too small. This species does not bear confinement well, and I have never reared it.

HYDROPTILIDAE. I have been disappointed at finding only one species of Hydroptilidae in my brook, and this I have not reared. The case (fig. 19) is flat, gray and seed-like, and is attached by its edge to the stones



Fig. 19.

in the brook, where the current is rapid. **HYDROPSYCHIDAE.** The most interesting species of the order found in Stony Brook, and also abundant in various smaller brooks, weaves for itself a little net, probably for the purpose of catching its food. This species, with its nets, has been found to be very common in other parts of the United States.

The net (fig. 20) is upright, supported by a small vertical arch or ring of vegetable bits, and the opening of the larval house is always on the up-stream side of the net. In some places the nets and their accompanying houses are found singly on the bottom, or on



Fig. 20.

the stones in the brook—in other places they are thickly clustered together, or, placed side by side, they may extend nearly across the brook.

The larvae are gray, with an arcuate body, and tufted gills hanging thickly from the under side. They pupate in May. The nets disappear during pupation, and the houses, which, while the larvae were active, were shiftless arrangements of loose vegetable bits, or grains of sand carelessly held together with silk, are now (fig.



Fig. 21.

21) oblong domes, strongly constructed of little stones, and fastened at their edges to the rocks, pebbles or sticks in the brook. The whole is lined with silk, small openings being left at each end for the respiratory current. These larvae die almost immediately when transferred from the rapidly flowing streams which they affect, to the tranquil waters of an aquarium. But like many other sensitive species, the well-developed pupae can be made to emerge in a set-basin, which has a constant stream of water from the faucet flowing through it.

Another species of this family, belonging to the genus *Plectrocnemis*, makes a tube of mud (fig. 22) which I at first thought must be manufactured by some large worm. I saw the ends of these tubes projecting from the muddy

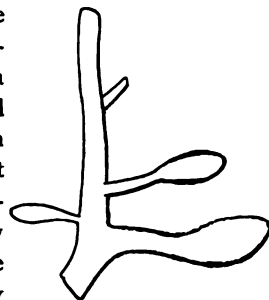


Fig. 22.

bottom of the brook, and by working my fingers about in the soft mud below them brought them out uninjured. But great was my astonishment on opening one of them to find within a slender, delicate, white larva, looking so small in proportion to the size of the tube that I could not believe it to be the maker, till researches into the other tubes revealed similar occupants in all of them. Fig. 23 represents the mouth parts of one of these larvae, enlarged. The tube in the centre is the labium (spinaret) which spins the silken threads, the substance used by all caddis-worms to fasten together the materials of their houses, and fabricate the gratings or disks which protect them during pupation.

These *Plectrocnemia* cases occur in colonies, but this spring, 1891, I could not find any. They pupate in May, and the pupa may be found in a swelling of a vertical tube



Fig. 23.



Fig. 24.

(fig. 24). I do not understand what use the larvae make of the lateral chambers. Some in my aquarium, however, only constructed horizontal tubes, in which they lived and transformed.

RHYACOPHILIDAE. In this family the pupa is enclosed in a thin brown leathery cocoon. I have found two species, but I am not sure whether I obtained them in Stony Brook, or in its smaller tributaries. In one of them the case is of no regular shape, being composed of a very few stones, proportionately large.

The other case (fig. 25) is quite peculiar. It is abundant in the Bussey Brook, and I have also found it in Brookline and Dedham. It is about 9 mm. long, roundish oblong in shape, and strongly arched above, and made of coarse sand or gravel. On turning it over, one sees a shelf of fine sand, like the thwart of a boat, across the middle of the case. This disappears during pupation. In Bussey Brook I found one pupa on May 9th, 1891, though most of the cases were still occupied by the larvae.



Fig. 25.

HALISIDOTA CARYAE.

BY CAROLINE G. SOULE, BROOKLINE, MASS.

A mat of eggs was found on the under side of a leaf rather high up in a thorn-tree, on June 28th, 1891, Brookline, Mass. The eggs were close

together, about one hundred in number, hemispherical, the flat side being on the leaf. When found they were of a leaden color, and soon each showed a

red streak, then a black dot near the centre of the top, the dot being the head of the larva. On June 29th, they hatched.

The *young larvae* were of a dull white color, with a black dorsal patch on the 1st segment, and a black dot below this on each side. The other segments had, on each side, two large black dots and a small one set in a triangle, and a smaller dot on the stigmatal line. Anal shield black. Head became black. Feet black; props white; anal props dotted with black, very slender. Sparse black hairs all over the body. The black was very shining.

The larvae fed and rested in a close crowd. They were very active, moving very rapidly. They ate only the green pulp of the leaf, and wanted much water. July 3rd, they spun a web on the leaf and all settled on it in rows.

July 5th, *First moult*. Head very large and black, conspicuous. Body as before, except that the sparse hairs were partly white, partly black; and the 2nd and 3rd segments had each two large black warts on each side of the dorsal line and one on the stigmatal line; anal segment had two large black warts instead of being all black. The spiracles were black, and showed clearly. The white color of the body was an opaque, glossy white, like porcelain, and the 2nd and 3rd segments looked very white, having fewer black marks than the others. The hairs were longest near the head, and projected over it. On July 10th they spun a web for moulting.

July 12th, *Second moult*. As before, but larger, and with the hairs longer and denser.

The larvae lived now in two crowds, one on each side of the hickory leaf which I substituted for the thorn, and

still ate only the pulp. On July 16 they spun a web on each side of the leaf.

July 18, *Third moult*. Head round, slightly bilobed at top, shining black. Body as before except the hairs. 1st, 2nd and 3rd segments as before. 4th and 10th segments had a longer pencil of black hairs arising from the black wart nearest the dorsal line, on each side, the hairs meeting over the line so as to give the effect of a single pencil. On each side, lower down, was a longer, single pencil, also black. The other segments had the dorsal double pencil, and all had longer white hairs on the sides, these being longest over the head and anal segment.

The larvae now began to eat through the fibre of the leaves, and on July 21st, spun a web.

July 23rd, *Fourth moult*. As before, but larger. July 28th, spun a web.

July 30th, *Fifth moult*. Head, feet, props and venter black. Body more speckled with black, the ground color being greenish white. Short, thick, white pencils on each side of the dorsal black ones, lay close against these, and formed with them a convex ridge along the dorsum. The lateral hairs were less dense and longer. Two thin long, white pencils on 1st, 2nd, 11th and 12th segments, the first two pairs extending over the head, the last two over the anal end.

The larvae ate enormously and moved very fast. When touched vigorously they curled up and rolled off the leaf, but did not mind being jarred or moved. Aug. 5, spun a web.

Aug. 7th, *Sixth moult*. Length $1\frac{1}{2}$ inches, though two or three measured $1\frac{1}{4}$ inches. The hairs were denser on the dorsum, and had a grayer tinge. Otherwise as before.

Aug. 16. They measured $1\frac{1}{4}$ inches

in length, and began to spin cocoons. They spun first a slight net, and covered it with their long hairs laid on lengthwise and lying smooth and flat. Through this net they pushed their short hairs at right angles, or nearly so, with the surface, so that these hairs stood up as if growing on the cocoons, and gave them a rough surface—like that of a head whose hair has been cut very short, but not shaved. The cocoons varied in length from $\frac{7}{8}$ inch to $1\frac{1}{8}$ inches. They were of a regular ovoid shape, and of a gray color from the black and white hairs of the larvae. Some were spun on the

side of the tin, some on the cloth over the top of the tin, and more on the under side of the leaves, though with no attempt to draw the leaf over the cocoon.

The hickory trees were so defoliated by these larvae this year, that I destroyed all but twenty of my brood, as soon I was sure what they were. Of the twenty none died.

Aug. 20. The pupa cast the larva-skin.

Pupa. $\frac{1}{2}$ inch long, smooth, stout, larger around the abdomen than around the thorax; with eyes and antennae well marked. Its color was bright tan. There was no anal hook.

A LIST OF SOME OF THE CATALOGUES AND LOCAL LISTS OF NORTH AMERICAN COLEOPTERA.—I (A.-G.).

BY JOHN HAMILTON AND SAMUEL HENSHAW.

In studying the distribution of certain of our species of Coleoptera it has been necessary to go over a considerable part of the American literature; when so doing a memorandum of all lists and catalogues was made and is now published as an aid to others engaged in similar studies.

Some of the lists contain so few species as at first sight to appear unworthy of note, but frequently they include some of the most interesting and valuable records; in fact the value of a local catalogue is often to be estimated not so much by the number of species contained as by the geographical position of the locality itself, and the accuracy of the determinations.

We make no comments on the correctness of the identifications in the various lists. The student can form his own estimate of them.

All lists here quoted have been personally examined unless noted to the contrary.

Notice of any omission will be very welcome.

1 **Anon.** List of Coleoptera [of Canada]. n.p., 1867, 12 p.
1131 species are listed.

2 **Austin, E. P.** Catalogue of the Coleoptera of Mt. Washington, N. H. (Proc. Bost. soc. nat. hist., 1874, v. 16, p. 265-276.)

221 determined and 13 undetermined species are listed; new species are described by Leconte.

3 **Austin, E. P.** Supplement to the check list of the Coleoptera of America, north of Mexico. Boston, 1880, 4 + 67 p.

1520 species are added to the list raising the number to 8970; many corrections in synonymy are made; includes all species described till July 1880.

4 **Beadle, D. W.** List of coleopterous insects. Collected in the county of Lincoln, C. W. (Can. nat. and geol., 1861, v. 6 p. 383-387.)

172 species are listed; some few are not fully identified; the collector was indebted to Dr. Leconte for the names of the species.

5 **Belfrage, G. W.** Price list of Texan Coleoptera. (Psyche advertiser, 1876, v. 1, 6 p.)

467 species and varieties are listed.

6 **Bell, James T.** Collection notes for 1880. (Can. ent., 1881, v. 13, p. 58-60.)

29 determined species of Coleoptera, 17 of which are new to the list of the Ent. soc. Ontario, are enumerated; 5 undetermined species are noted; all were taken at Belleville, Ont., in moss from March 1 to May 24.

7 **Bell, J. T.** List of Staphylinidae taken at Belleville, Ont. (Can. ent., 1885, v. 17, p. 49-50.)

66 determined species are listed; about 25 others are indicated.

8 **Bell, Robert, Jr.** Catalogue of animals and plants collected and observed on the south-east side of the St. Lawrence from Quebec to Gaspé and in the counties of Rimouski, Gaspé and Bonaventure. (Rep. progr. Can. geol. surv., 1858, 1859, p. 243-249.)

69 determined and 4 undetermined species of Coleoptera are listed on p. 247-249. The species were identified by Dr. Leconte.

9 **Blanchard, Frederick.** A list of the Buprestidae of New England. (Entom. amer., 1889, v. 5, p. 29-32.)

62 species are listed with notes of capture and food habits.

10 **Bland, James H. B.** Catalogue of the longicorn Coleoptera taken in the vicinity of Philadelphia. (Proc. ent. soc. Phil., 1861, v. 1, p. 93-101.)

A list of 128 species with notes on occurrence and abundance.

11 **Brodie, W.** List of Coleoptera collected by Mr. Bruce Bailey in Kicking Horse Pass, Rocky Mountains, C. P. R., 1884. (Proc. Can. inst. Toronto, 1888, ser. 3, v. 5, p. 213-215.) Separate: 3 p.

80 determined and 5 undetermined species are listed.

12 **Brodie, W. and White, J. E.** Check list of insects of the Dominion of Canada. Toronto, 1883, 67 p.

2490 species of Coleoptera are enumerated on p. 23-49.

13 **Carpenter, W. L.** Report on the alpine insect fauna of Colorado. (Rep. U. S. geol. surv., [Hayden's 7th rep.], 1874, p. 539-542.)

16 species of Coleoptera are listed.

14 **Carpenter, W. L.** Report on the alpine insect fauna of Colorado and New Mexico, season of 1875. (Annual rep. chief engineers for 1876, 1876, pt. 3, p. 521-525.) (Appendix JJ annual rep. chief engineers for 1876, 1876, p. 301-305.)

29 species of Coleoptera are listed.

15 **Cokerell, T. D. A.** Notes on the insect fauna of high altitudes in Custer county, Colorado. (Can. ent., 1890, v. 22, p. 37-39; 55-60; 76.)

29 species of Coleoptera are listed; a few are not fully identified.

16 **Couper, William.** List of Coleoptera and Diptera taken at Quebec and other parts of Lower Canada. (Trans. lit. and hist. soc. Quebec, 1864, n.s., pt. 2, p. 75-93.)

159 species of Coleoptera are listed, place and time of occurrence given; some are not fully identified.

17 **Couper, William.** List of Coleoptera taken at Quebec and other parts of Lower Canada. (Trans. lit. and hist. soc. Quebec, 1865, n.s., pt. 3, p. 27-36.)

114 species are listed; a few notes are added.

18 **Couper, William.** Anticosti Coleoptera collected on the island in 1873. (Can. ent., 1874, v. 6, p. 137-138.)

49 determined and 4 undetermined species are listed.

19 **Couper, William.** Coleoptera found in the province of Quebec. (Can. sportsman and nat. 1882, v. 2: ; 1883, v. 3: .)

Not seen; 1012 species are listed.

20 **Cresson, E. T.** Catalogue of the Cindelidae of North America. (Proc. ent. soc. Phil., 1861, v. 1, p. 7-20.)

118 species are listed; includes Mexico and the West Indies.

21 **Crotch, G. R.** Check list of the Coleoptera of America, north of Mexico. Salem, Mass., 1873, 136 p.

7450 species are numbered, not including varieties: includes all species described till Sept. 30, 1873.

22 **Doran, Edwin W.** Catalogue of the insects of Tennessee.

Not seen.

23 **D'Urban, W. S. M.** Catalogue of Coleoptera collected by Mr. Robert Bell, 1858. (Can. nat. and geol., 1859, v. 4, p. 242-244.)

A list of 73 species collected chiefly on the south-east side of the Gulf of St. Lawrence between Quebec and Gaspé; the species were identified by Dr. J. L. Leconte.

24 D'Urban, W. S. M. A systematic list of Coleoptera found in the vicinity of Montreal. (Can. nat. and geol., 1859, v. 4, p. 307-320: 494-496.)

293 species are listed; some are not fully identified; nearly all were named by Dr. J. L. Leconte; a list of 9 species taken at Sorel but not yet met with near Montreal is appended.

25 D'Urban, W. S. M. Catalogue of animals and plants collected and observed in the valley of the river Rouge and the neighboring townships in the counties of Argenteuil and Ottawa. (Rep. progr. Can. geol. surv., 1858, 1859, p. 226-243.) (Can. nat. and geol., 1860, v. 5, p. 81-86.)

99 determined species of Coleoptera are listed on p. 233-237; several undetermined species are indicated and 34 species from L'Orignal and Grenville are enumerated on p. 237.

26 D'Urban, W. S. M. Catalogue of Coleoptera collected by George Barnston, Esq., of the Hon. Hudson's Bay Company, in the Hudson's Bay Territories. (Can. nat. and geol., 1860, v. 5, p. 227-229.)

88 species are listed; a few are not fully identified; Dr. J. L. Leconte furnished the list.

27 Dury, Charles. List of the Coleoptera observed in the vicinity of Cincinnati. (Journ. Cinc. soc. nat. hist., 1879, v. 2, p. 162-178.) Separate: 17 p.

1443 species and varieties are listed.

28 Dury, Charles. Coleoptera of the vicinity of Cincinnati. (Journ. Cinc. soc. nat. hist., 1882, v. 5, p. 218-220)

167 species are added to the list.

29 Dury, Charles. Notes on Coleoptera, with additions to the list of the Coleoptera of Cincinnati. (Journ. Cinc. soc. nat. hist., 1884, v. 7, p. 91-92.)

12 species are added.

30 Fay, H. T. On winter collecting. (Proc. ent. soc. Phil., 1862, v. 1, p. 194-198.)

129 species of Coleoptera are listed taken in the vicinity of Columbus, Ohio, during the winter months.

31 Fletcher, James. List of diurnal Lepidoptera and Coleoptera. (Rep. progr. Can. geol. surv., 1887-88, 1889, p. 75 J.)

21 species of Coleoptera taken on the south coast and islands of James Bay are listed.

32 Gardiner, F. Jr. Coleoptera of the White Mountains. (Psyche, 1879, v. 2, p. 211-213.) Separate: 3 p.

89 species are listed with localities and altitudes.

ON THE SPECIFIC DISTINCTNESS OF HALISIDOTA HARRISII, WITH NOTES ON THE PREPARATORY STAGES OF THE SPECIES OF HALISIDOTA INHABITING NEW YORK.

BY HARRISON G. DYAR, YOSEMITE, CAL.

As is well known, two kinds of *Halisidota* larvae inhabit the Atlantic states, differing only in color and in their food plants. Both were noticed by Harris, and the form with black hair pencils was figured by Smith and Abbot as *H. tessellaris*. In 1863, Walsh separated the forms as distinct species, indistinguishable in the imago, and gave the name *H. harrisii** to the form with

orange hair pencils that is found on the sycamore. In Grote's list of 1882, *harrisii* is given as a dimorphic larval variety of *H. tessellaris*, and so it has been considered. However, it seems to be a fact that *harrisii* occurs only on the sycamore and *tessellaris* never on that tree, so that if the former is a variety of the latter, the variation must be due to the influence of the food-plant; but I have recently observed that the larvae differ in their first stage, and it is hardly to be supposed that the food-plant would

*At first he gave the name *antiphola* to the form with black hair pencils, Proc. Bost. soc. nat. hist., IX, 288, but subsequently corrected this. Proc. ent. soc. Phil., III, 413, 430.

influence them before hatching. Moreover, they differ in another important particular, which has not so far been recorded, namely, in the number of larval stages. *Harrisii* has seven stages, with a width of head at maturity of 3.3-3.6 mm., while *tessellaris* has nine stages and a width of head of 4.1-4.3 mm. These measurements were derived from a number of larvae raised in confinement, as well as from some found in nature, and correspond, varying only within the limits indicated.

I have not been able to find any difference in the markings of the imago bred from these two forms of larvae, but an examination of the male genitalia reveals differences that appear to be constant. In *harrisii*, the side pieces are furnished on the lower side with two tapering, overlapping points, the lower one longer than, and projecting beyond the upper; in *tessellaris* these points are also present, but the upper one is slightly longer than the lower, the two closely overlapping, almost appearing as a single point. The parts seem slighter and more transparent than the corresponding ones in *harrisii*. From the above facts, I conclude that *Halisidota harrisii* Walsh, is a distinct species, entitled to stand as such in our lists.

The fact that it is not to be distinguished from *H. tessellaris* in markings can not militate against this conclusion, as there is no essential reason why two species should differ in markings except that they naturally would do so in most cases, owing to their not intercrossing. We can hardly suppose that the special

markings of a species afford a means of recognition for the individuals of it, except in a general way, as this would imply too nice discrimination in these insects. But that they can discriminate, even in rubbed and faded examples which would be the despair of an entomologist, there can be little doubt, though I can not believe that they do this by the sense of sight alone.

In New York state there are two other species of *Halisidota*, namely *H. caryae* and *H. maculata*, that stand to each other in much the same relation as *H. tessellaris* and *H. harrisii*, but the differentiation seems to have progressed further, so that they are readily separable in the imago state. *H. caryae* has nine stages, as I have already recorded in *Psyche*, while *H. maculata*, has but seven to judge from the last two, which are all I have observed. In the last stage, *caryae* has a width of head of about 4.3 mm., while *maculata* has one of 3.2-3.6 mm.

HALISIDOTA HARRISII Walsh.

Egg. Rounded, obtusely conoidal, the base flat; very shiny pearly greenish white; diameter 0.7 mm. Laid in a mass of about 20 on the under side of a leaf of the food-plant.

First larval stage. Head pale whitish, eyes black, mouth brown; width 0.4 mm. Body whitish, the warts concolorous, each bearing a single blackish hair.

Second stage. As before except that the head is 0.6 mm. wide and the hair is more abundant, several from each wart, longest near the head. It is whitish, mixed with shorter stiff black hairs.

Third stage. Head as before, width 0.9 mm.. Body whitish, with a row of blackish subdorsal dashes on the middle segments. Warts

concolorous with the body. Hair whitish, but black and shorter from the warts of row 3 on joints 4, 5 and 12. Longer white hairs overhang the head.

Fourth stage. Head pale whitish, labrum and antennae white, jaws brown, ocelli black; width 1.3 mm. Body and warts whitish with a narrow, broken, black subdorsal line. Hair white with pencils of orange colored hair from the warts of row 2 on joint 4 and of white hair from row 3 on joint 12 besides short black ones from row 3 on joints 4, 5 and 11.

Fifth stage. As before; width of head, 1.7 mm. The pencils of hair are now arranged as follows: mixed orange and white hair from row 2 on joint 3, all orange from row 2 on joint 4, white from 3 on joint 12 and from 4 on joints 3 and 4, only slight on joint 3. Short black hairs from row 3 on joints 4, 5 and 11. Spiracles black ringed.

Sixth stage. Width of head 2.5 mm. Body whitish, a row of black spots surrounding the white spiracles and another subventral row. Hair white, forming a ridge like a keel along the dorsal line. Pencils as in the mature larva.

Seventh stage. Head brownish testaceous, shiny, mouth and antennae white, eyes black, width 3.5 mm. Body sordid white, the warts arranged as in the other genera of the Arc-tiidae except that row 4 is situated stigmatically, posterior to the spiracles and the four ventral warts (row 7) are very small, situated, as usual, on the venter of the apodal segments (the 1st, 2nd, 7th, 8th and 9th abdominal segments). Some irregular black subdorsal marks on joints 2 to 4 partly surrounding the warts of row 3 and some slight marks above the bases of the legs. Spiracles white, in a narrow black border. Hair pale straw color or very pale grayish, keeled on the dorsal line. From warts 2 on joints 3 and 4 a pencil of orange colored hairs; from warts 4 on joint 3 (slightly) and joint 4 and from warts 3 on joint 12 a pencil of white hairs; a few long hairs from the large wart on joint 13.

Cocoon. Composed of hairs and silk, of dense texture, but comparatively smooth, the hairs being laid on flat and not as with *H. caryae*.

Pupa. Thorax and abdomen enlarged, the latter narrowing each way from the middle; abdominal segments appressed, motionless; cremaster represented only by 4 or 5 spiny hairs with their ends enlarged or curled. Body sparsely punctured, cases creased. Color shining dark mahogany. Length 15 mm., width 6.2 mm., height 5.7 mm.

Food-plant. Sycamore (*Acer pseudo-platanus*). Larvae from Ulster county, N. Y.

HALISIDOTA TESSELLARIS Smith and Abbot.

Egg. Not observed.

First stage. Head black, width 0.4 mm. Body whitish shaded with yellow dorsally on joints 3, 4 and 12. Cervical shield warts and anal plate black, each wart bearing a single hair.

Second stage. Head 0.6 mm. wide. Body as before but the hair is more abundant, several growing from each wart.

Third stage. Head black, labrum and antennae white; width 0.9 mm. Body as before, warts of rows 1, 2 and 3 black and a subdorsal blackish line centrally. Hair more abundant, especially at the extremities.

Fourth stage. Head 1.3 mm. wide, colored as before. Body whitish, with large subdorsal orange spots posteriorly on joint 3 and anteriorly on joint 4 and on joint 12. The warts are arranged as in the mature larva, rows 1, 2 and 3 are black, the rest pale. All the warts bear thin short, whitish hairs.

Fifth stage. As before, but the head is 1.7 mm. wide, and from warts 2 on joint 4 grow pencils of black hair, from row 1 on joint 12 the same but the two converge over the dorsum to form a single tuft. White pencils from wart 3 on joint 12. Other hair whitish, longer hairs overhanging the head and posterior extremity. The dorsal region of the body is blackish, the sides pale. Spiracles white, distinct.

Sixth stage. Head shiny black, labrum and antennae white; width 2.1 mm. Body black above, whitish below, the hair gray and the pencils now arranged as in the mature larva.

Seventh stage. Head black, labrum and bases of antennae white; width 2.7 mm. Body black, obscured by the thick hair; abdominal feet whitish; spiracles white. From warts 2 on joints 3 and 4 and from warts 3 on joint 12 grow pencils of long black hair and from warts 4 on joints 3 and 4 and from the large wart on joint 13, thinner pencils of white hair. Other hair even and close, keeled on the dorsum, light drab or dull ochre. Warts gray, except warts 3 on joint 12, which are pale and have orange about their bases. Only traces of the orange marks on joints 3 and 4.

Eighth stage. As before. Head 3.5 mm. wide; body velvety black, the hair on the dorsal ridge appearing somewhat darker than elsewhere.

Ninth stage. Head black and shiny, labrum and antennae white; width 4.3 mm. Body black, marked as in the seventh and eighth stages. Spiracles white. Thoracic feet testaceous; the abdominal, pale. Cervical shield black, bisected. Hair drab or dull ochre yellow, the pencils as before, but now 11 mm. long. The warts are arranged as in *H. harrisii*.

Cocoon. Composed of hairs and silk, of dense texture, but comparatively smooth, the hairs being laid on flat.

Pupa. Like that of *H. harrisii*.

Food plants. Nearly all deciduous trees except the sycamore. The larvae here described in the first stage occurred on beech (*Fagus*).

Larvae from Dutchess county, New York.

HALISIDOTA MACULATA Harris.

Sixth stage. As in the following stage except that the hair is less abundant, not obscuring the body. Width of head 2.3 mm.

Seventh stage. Head rounded, smooth shiny black, labrum and bases of antennae

white; a few hairs; width 3.4 mm. Body black, thoracic feet shiny black, the abdominal ones white with black hairs and whitish claspers, their minute hooks brown. Spiracles white. The warts are black, arranged as in the other species of *Halisidota*, namely: row 1 a wart on joints 5-12 inclusive, situated anteriorly; row 2 subdorsal and row 3 lateral on joints 2-13, small on joint 2 and coalesced on joint 13; row 4 posterior to the spiracles; rows 5 and 6 in the subventral space, and row 7 four very small warts on the venter of the legless segments. All the warts bear spreading tufts of yellow feathery hair, brighter in color than that of *H. tessellaris*. From warts 1 on joints 5-12 on the upper side, grow black tufts forming a row of square dorsal tufts as in *H. caryae*, those on joints 5 and 12 a little longer than the others; from row 5 on joints 5 and 11, centrally on the wart, a rather long black tuft; from the upper parts of the warts of rows 3 and 4 grow a few long white hairs, as also from rows 2 and 3 on joints 5 and 11; from rows 2 and 3 on joints 12 and 13 anteriorly a few more white hairs, those on joint 12 have a number of hairs, the one from row 3 on joint 12 forming a decided pencil, though rather thin. Length of white hairs 10 mm.; of larva 30 mm.

Cocoon. Fastened by part of one side, elongate elliptical, much like that of *H. caryae*. It is rather thin, made of silk and hair, the fine larval hairs stuck through, making the cocoon appear something like velvet. Length 21 mm., thickness 10 mm.

Pupa. Thorax and abdomen enlarged centrally with a depression between them; ventral side straight, slightly flattened; ends obtusely rounded; abdominal segments without motion. The cremaster consists of a tuft of spiny hairs. Color, shining dark brown. Length 15 mm.; width 6 mm.

Food plants. Various deciduous trees. The larvae were mostly found on maple (*Acer*).

Larvae from the Catskill Mountains. Ulster county, N. Y.

HALISIDOTA CARYAE *Harris.*

My notes in regard to the number of stages of this species have already appeared in *Psyche*, and, as the latter stages are all essentially alike and the larva is well known and has often been described, I will omit further remarks upon it.

FOOD-PLANTS.—On Sept. 11th I found several larvae of *Papilio turnus* on *Carya glabra*, on which I have not found them before. They were large, bright in color, and nearly full grown, and the leaves near them were much eaten. All were on one tree, and the only other tree very near was a chestnut. I have found them, in Brookline, on ash, wild cherry, lilac, maple, tulip-tree, plum; in Vermont on willow; in New York on magnolia.

I found, on the same day, one larva of *Apatela americana* on rose acacia, and one on butternut. I have not found one on maple this year, though I have found many on elm and basswood.

Brookline, Mass. *Caroline G. Soule.*

CHOICE OF FOOD.—The larva of *Platysamia ceanothi* differs from all Bombycid larvae I have reared, in always preferring the young tips of twigs, instead of wanting older leaves to eat as they pass the second moult. A brood raised on wild cherry would not eat the older leaves at all, usually stopping with the sixth leaf from the tip of the twig,—these twigs were saplings, not pieces from a tree—and this habit they kept till they spun. *C. promethea* larvae refused the young tips as soon as they had moulted for the second time, and finished up the leaves refused by the *ceanothi*!

Caroline G. Soule.

LITERARY NOTES.—Messrs. Reeve and Co., of London, announce their intended publication, if a sufficient number of subscribers can be obtained, of a work on the indigenous Heteroptera of Great Britain and Ireland, by Edward Saunders. It will be

issued in eight parts at five shillings per part, with colored plates, the number of which is not stated.

The American entomological society announces the publication early in October of a Check list of the Lepidoptera of America, north of Mexico, by Prof. John B. Smith. The low price of one dollar a copy will bring it within the reach of all.

Seven parts of Moore's *Lepidoptera Indica* have now appeared and it is only in the last that the Euploeinae are completed. This family is divided, as previously by the author, into two groups: the Limnaeina of which there are here described 10 genera and 29 species, of which 4 of as many species have illustrations of the larva and pupa; and the Euploeina with 16 genera and 50 species, only 4 of which (of 3 genera) have their early stages figured; but let us be thankful; it is the largest collection of illustrations of larval and pupal Euploeinae ever brought together, and certainly justifies some at least of the generic divisions made. In all there are 53 plates given up to Euploeinae, and they contain 225 figures of the imago (every species being figured) and 31 figures of caterpillars and chrysalids. In the seventh part the Satyrinae are begun, but only carried as far as the key to the Indian genera.

PROCEEDINGS OF SOCIETIES.

CAMBRIDGE ENTOMOLOGICAL CLUB.

9 May, 1890.—The 154th meeting was held at 156 Brattle St. Mr. J. H. Emerton was chosen chairman.

Mrs. L. J. Livermore was elected to active membership.

Mr. Holmes Hinkley showed a structure found on a violet leaf in his garden. Some discussion followed as to whether it was made by an insect or was a mere fungus growth.

Mr. S. H. Scudder showed a copy of the third volume of De Nicéville's *Butterflies of India*, and read an extract from it on a lycænid butterfly, the larva of which feeds on the pomegranate. (See *Canad. entom.*, 1890, v. 22, pp. 243-248.)

PSYCHE,

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PSYCHE.

SOME OLD CORRESPONDENCE BETWEEN HARRIS, SAY AND PICKERING.—IV.

[HARRIS TO SAY.]

MILTON, Feb'y 21, 1825.

Dear Sir,

Mr. Nuttall has just sent me your letter of Jan'y. 8th, with the insects which you committed to his charge. I feel myself under additional obligations to you for your attentions, and am highly gratified with the specimens which I have received from you.

I have met with but one individual of the *Dicalus elongatus*; and, since my last, have obtained the male of *Boleto-phagus cornutus*; Your specimen is the female, & is of a lighter colour, as is represented in the plate attached to Panzer's Prod[r]omus. Both these insects must be considered as rare in this section of the country. The *Nemognatha vittata* & species of *Lytta* are exceedingly interesting to me. The other insects I have never discovered here; they are therefore valuable additions to my small collection.

Mr. Fuller purchased for me the first vol. of your American Entomology, which is executed in a most beautiful manner, & must add greatly to the literary fame you already enjoy. You are entirely at liberty to quote my localities for any insects which you may hereafter describe, either in this work or the Journal Acad. Nat. Sc. In your Entomol-

ogy I find a species of *Smerinthus* which I have never noticed: we have one however very much like it, which I have taken to be the *ocellata*; whether it may be the *myops* or *excaecata* I cannot determine, having never seen the descriptions of those species.

Feeling myself the great want of books on American entomology, & knowing the impossibility of our insects being determined without good descriptions, I have had it in contemplation to describe all the species which I have collected, with the view to publishing a small local Fauna of the insects in this vicinity. With this intention I have resolved to visit Philadelphia the ensuing spring, to request your assistance in determining the genera & species. You have described so many of our insects which I had considered new, and your descriptions of many of them having never reached me, that I was quite surprised to find that, among those which I have sent you, there were so few nondescripts. I shall immediately obtain the Trans. Am. Philos. Soc. & if possible the Journal of the Lyceum.

As you may publish your descriptions of Coleoptera before I have an opportunity of consulting with you, I will give the names of such of ours as now occur to me, with some remarks on those whose names you gave me in your last letter.

Cicindela purpurea is very common in dry pastures. *C. hirticollis** is rare.* *C. sexguttata*, & 2 varieties, one with an additional spot on the disc, the other without the terminal one, are found in sandy paths. The habitat of *punctulata* is the same. *Elaphrus riparius* is rare. *Carabus catenulatus* is scarce. *Agra pensylvanica* I have found beneath stones on sunny banks. *Omo-phron limbatus* Latr. inhabits near fresh water streams; *Dytiscus marginalis* in stagnant water. Several other species of *Dytiscus* are found, but I have not made out the species. We have a *Buprestis* which appears to be the *virginiensis*, but my specimen has not the metallic lustre of yours. *Elatер oculatus* is common; I have not ascertained the habitat of its larva. We have your *E. dorsalis*, & *E. corticinus*. *Lycus dimidiatus* & *L. reticulatus* are generally taken on the wing in the day time, about bushes, & hedges. *Malachius 4-maculatus*? the male is distinguished by having the 2d joint of the antennæ (not the 3d joint, as in Fabricius) dilated, quadrate, & with a deep indentation. But what is most remarkable is that, even by aid of a powerful magnifier, I could detect only 4 joints to the anterior tarsi. Like others of the genus this species is furnished with 4 retractile, tridigitated *tentacula*? or processes, one on each of the thorax & abdomen. Having fixed my specimen to a card I cannot compare the colours beneath with those of your

vittatus; but those of the superior surface correspond exactly, except the antenna, the first and 2d joints of which are rufous, the remainder blackish. Length of the male just $\frac{1}{8}$ inch. The female has the usual number of joints to the anterior tarsi. There some varieties particularly of this sex: In these the thorax is destitute of the black spots; the dilated humeral portion of the margin is extended into a fascia which unites with the suture. This species of *Malachius* I have found in meadows, on the flowers of *Chrysanthemum leucanthemum*, in June & July. We have several species of *Ips* which are allied to the *fasciata*. *Attagenus pellio* is very common in houses, & a species, or perhaps variety, without the white dot on the elytron. I have met with a *Lucanus* which corresponds with your *parallelus*, only that there is no small tooth "on the middle of the inferior inner edge" of the mandibles. *Passalus interruptus* is common. *Diaperis maculata* Oliv. is found here upon fungi. Three species of *Lytta* are also found here, viz: *L. cineræa* on the potato-vine &c, *L. marginata* on the *Clematis virginiana*, & *L. atrata* on the *Solidago*. *Bruchus pisi* prevails every year. We have your *Lamia aspersa*, also *L. nebulosa* F. and *Callidium bicolor*, F.

I will now recur to the insects which I sent you in box 1. If No. 2 be *Calosoma calidum* of Fabricius (which I presume you intended when you wrote *calida*) that author was mistaken in describing it as apterous; all the specimens which I have seen certainly have

*In Prof. Peck's cabinet are the only specimens I have seen.

wings. No. 4 I had taken to be the *cisteloides* of Schönherr, *flavipes* of Paykull. To No. 9 I had fixed the name of *Q. cupreus*, F.; it is your *Pœcilia lucubanda*; to No. 16, your *Amara impunctata*, I gave the name of *Carabus dispar*, Paykull, or *vulgaris*, F. I should not have suspected your *Harpalus rusticus* (No. 11) to have belonged to the genus *Harpalus*, judging from a cursory view, it seems very unlike the other species of that genus. Your *H. viridis*, Nos. 12 and 13, stand in my cabinet by the name of *Æneus*? F. *proteus*? Paykull. The latter name appears appropriate from the variety of shades which different individuals exhibit. You will, I hope, excuse my confessing my mistakes, for such I presume they must be; for you have the best means of knowing that these individuals had not been before described, or that I had not rightly made them out. No. 38 is not the female of *Lampyrus corrusca*. I have obtained the sexes in coitu, & the female is not apterous. No. 41 which you mention as a variety of *L. laticornis*, F. I have found in great numbers on shrubs in July, & never in company with the *laticornis*, No. 42: Hence I conclude it must be distinct, & therefore marked it as the *ater*? F. No. 47, your *S. caudata*, stands in my cabinet as the *Silpha lapponica*, to Fabricius' description of which I thought it corresponded. I cannot discover teeth on the posterior thighs of No. 48, *S. surinamensis* F., as described by Fabricius. Is No. 59 the same as *Dermestes*

marmoratus, Knoch, in Melsheimer's catalogue? No. 66 answers the description of *Scarabæus Hecate*, Panzer, (Faun. Amer. Boreal. Prod[r]omus). No. 74, your *Sc. relictus* is very common in certain localities. On May 21st 1822 I saw the ground covered with them at Hoboken, New Jersey; & last summer great quantities were exhumed from beneath a dung hill in this vicinity, in all their stages of larva, pupa, & imago. No. 75 *Melolontha quercina*, Knoch, is very injurious to fruit trees in June; the larva is equally destructive to the roots of grass. Can No. 82 be a variety of *M. varians*. It has not the ovoid form of the *variens*, & seems nearer allied to your *iricolor*. *Trichius scaber* diffuses so strong an odour that I have frequently discovered it by that alone, when at the distance of several yards. The larva in habits the trunks of decaying trees.* *Melolontha elongata* is found in profusion on oaks in June. To No. 91 I gave the name of *Trox nigritus*, & to 92 that of *T. pulverulentus*. I omitted in course No. 22 which is my *Carabus pusillus*, & No. 33 *Elatér pumilus*. No. 93, to which you assign the name of *Tenebrio barbatulus*, lives like the *molitor* about stables, granaries &c. The larva devours corn; is elongated, depressed, corneous, & of a yellow colour, with 6 very small legs at the anterior extremity, & a short tubercle beneath the posterior to assist it in moving. In the pupa the segments of the abdomen are produced, flattened & finely

*Is *Trichius eremicola*, Knoch, the *Scarabæus ebenus* of DeGeer?

serrated, & the tail bifurcated. No. 95 is the only species of *Meloë* I have ever discovered; it is not uncommon in pastures. I cannot reconcile the descriptions of *Diaperis viridipennis* with my specimens of No. 94. They inhabit beneath the bark of decaying trees. To 99 I gave the name of *Curculio hirtus* in my collection. No. 103 I have always taken to be the *Megacepha marmorata*. No. 106 is the *Scolytus cerasi* of my cabinet. Is it not of the genus *Hylurgus*? No. 111 you have marked as a variety of *Callid. fennicum*. Fabricius describes that insect with violaceous elytra. I had marked 111 as the *flavum*, F. In the *Stenocorus putator*, Peck, the 2d and 3d joints of the antennæ are each terminated with one rigid spine; & I agree with you in thinking that it is probably distinct from the *bidens* & *villosus* of Fabricius. 170 is my *Donacia attenuata*. 127 *Crioceris (Lema) trilineata* is found on the vines of the potato & other *Solani* in June. The eggs are affixed to the leaves, & immediately on their being hatched the larvæ enter the earth. No. 133 inhabits the leaves of the apple tree. The larva devours the parenchymatous substance of the leaf, the cuticle remaining untouched. Here it changes to a nymph, & emerges from its retreat only when it has assumed the imago. The larvæ of 130 *Imatidium argus*, feed upon the leaves of the *Convolvuli*; those of 132, *Cassida aurichalcea*, on the leaves of the sweet potato, & the *Solanum dulcamara*. *Eumolpus*

auratus I have always found on the *Apo-cynum androsæmifolium*, and *Chrysomela trimaculata* on the *Asclepias syriaca* on which plant the larva & pupa of the latter are also found. *Coccinella 9-notata*, & *C. abbreviata* inhabit the leaves of the carrot, from which I have obtained the larva & pupa. Your *C. bioculata* is constantly found in all its stages on the *Ligustrum vulgare*. 163, your *Colaspis 10-notata*, I have found only upon the leaves of the oak. No. 175 is my *Helops piceus*.

The marine shells which I intended for you, were unfortunately mislaid or lost, & I have delayed this letter in the hopes of recovering & sending them by a private conveyance. They were not of much value for rareness or beauty, but were such as are common here, & which I can therefore replace in the course of the summer.

With sentiments of respect,
Yr. obed't friend
T. Wm. Harris.

[Endorsed with the following notes by Thomas Say]:—

Malachius 4-maculatus Fabr.; it is certainly the 3d j't. Fabr. is right; the ant'r tarsi have 5 very distinct joints. *Mal. vittatus* some of my spec's have the anten'a dusky at tip. *Lucanus parallelus* the fem. has the tooth somet's hardly obvious. *Calosoma calida* and several others Fabr. descr'd as apterous have wings.

THE EARLY STAGES OF THREE COLEOPTERA.

BY SAMUEL H. SCUDDER.

Finding among some old papers notes of the early stages of certain Coleoptera imperfectly known, I venture to print them. All the species were found upon sweet fern.

MEGILLA MACULATA.

The full grown larva has the head shining black, faint yellowish in centre. Body black above, brown beneath, except two yellow spots on the edge of the fifth abdominal segment; first thoracic segment with transverse yellow bands at front and hind edges; the second and third with a yellow dorsal stripe; second abdominal segment, except the middle third, yellow, fifth abdominal wholly yellow, and the other segments with a row of yellow spots on each side. Besides there are twelve longitudinal series of black papillae, six on the upper and six on the under surface, one to a segment in each series, those on upper larger than those on under surface, each giving rise to a short black hair.

The pupa is in general black. Head with a median yellow line. Thorax with a dorsal yellow stripe, a median transverse band and a stripe at the sides reddish yellow; from these a dorsal and lateral stripe of the same color pass backward and broaden in the middle of each segment, the first abdominal segment thus entirely reddish yellow except a subdorsal black spot on either side; besides in the interstices of the abdominal segments are other minute yellow and black spots; the thoracic appendages are black and the markings of the elytra of the future imago cannot be seen; ventral surface of abdominal segments white.

The hind legs protrude oddly on

either side of the body beneath the elytra like two side horns, and the legs of the cast larval skin sprawl about the tail of the chrysalis, the last segment being immersed therein. When quiet, the chrysalis lies on the surface of rest, but if disturbed, it erects its whole body at right angles thereto, and then the interstitial markings of the abdomen are concealed. One individual changed to chrysalis on August 24. (Notes of 1859.)

COCCINELIA SANGUINEA.

The full grown larva has a small black head and a dusky body; in the middle of either side of each thoracic segment is a large black spot, covering nearly the whole surface on the first segment which is bordered anteriorly with dull orange; there is a dull orange dorsal band of irregular width along the whole body, its limits vague, and besides, on the abdominal segments, subdorsal, lateral and stigmatal series of black spots, one to each segment; on the sides of the first five abdominal segments are found some dull orange spots; the body beneath is dusky with a rather dull orange broad ventral band; the legs are black. Length 9 mm.

The pupa is in general of a dusky yellow; the head is black; thorax with a yellowish dorsal line and on either side of it at the posterior edge of each segment a black spot; the first thoracic segment has also another lateral black spot on posterior edge and a large black spot on the front edge; the wings and all the thoracic appendages are black where exposed; but otherwise apparently dusky or pale yellow; the abdominal seg-

ments are dirty white or black with yellowish spots, the first two segments having a predominance of yellow, the others of black; the ventral surface is dirty white or yellowish.

Two specimens changed to imago on September 10th at Cape Cod after eight days in pupa. (Notes of 1861.)

The pupa is figured by Comstock (Rep. U. S. entom. for 1881, pl. 18, fig. 4) and the larva by Candèze (Mém. soc. sc. Liège, vi, pl. 6. fig. 7.).

CHLAMYS PLICATA.

The larva of this beetle may be found abundantly the last of July and early in August hanging perpendicularly with its case from the under side of leaves of sweet fern.

It has an orange yellow body, deepening in tint toward the tail with a delicate suffusion above of light olivaceous green, but the head and long legs are jet black, and the dorsum of the thorax and the parts above the legs are of a dark testaceous. The whole body is sparsely covered with microscopic hairs, and one notes a depression in the middle of the dorsum of the last segment.

When taken from its case the tail is curled under its body and this is evidently its normal attitude.

The larval cases are from five to six millimetres long for the full grown creature, and at the most about three millimetres broad. They are smooth within but externally rough, black, oval, the oblique open end generally minutely flaring with a more or less distinct notch above and below, and especially below, for the better use of the legs; it looks as if made of black

papier maché and is evidently formed by accretion, as may best be seen by examining the under surface where there is an indistinct median groove, where the bands of accretions on either side seem to have been brought together. These accretions are laid on apparently at about ten or twelve times during the life of the larva, in an oblique course, broadest on the back and narrowest on the ventral side. According to Riley and Murtfeldt it has as its basis "a covering of dark sticky excrementitious matter . . . somewhat bell shaped, the upper end being largest, squarely docked and slightly depressed so as to form a circular rim around the margin" which the female constructs to cover the egg, and which is cut away from its attachments by the larva when born and made the basis of its movable house. The manner of enlargement has yet to be told.

The larva crawls with some rapidity, and when it retreats within its case it is wholly beyond the deepest cleft, the claws of the feet only projecting therefrom. When one is forcibly removed, it seems unable to get back again; at least such as I have experimented upon have failed to do so, though they tried hard to do so by going in head foremost; they succeeded in getting only the head and three of the legs inside, the length of the legs appearing a hindrance.

Before changing to pupa they turn around in the sac so that the anal extremity is toward the former opening, which is now closed, since in prepara-

tion for the change they glue this end tightly to the surface of a leaf, and with such a superfluity of substance as to make this end of the interior rounded.

At first the pupa retains the bright yellow color of the larva, the eyes and tips of the mandibles being black, and the outer surface of the legs and wings and especially the incisures of the legs infuscated. Afterwards when nearing the final change, the pupa assumes the color of the beetle, a brilliant deep bronze, though the abdominal rings, especially at the tip, still retain somewhat of their original yellow.

The pupal state lasts nearly four weeks in Massachusetts, in one instance from Aug. 4 to Aug. 30. The pupa seems to be free, moving at least its head and hinder legs with ease; in the change the old skin is thrown off as a thin transparent pellicle, which looks as if only large enough to cover the end of the abdomen, while the old larval skin may be discovered packed tightly away next the old opening. By using its jaws upon the end of the case with which they are in contact, the enclosed beetle succeeds in making little transverse cuts around the former bottom of the sac until finally the old egg-covering with a little more is lifted at the single part of the bitten circle remaining as at a hinge, and the beetle presents himself with all his fresh beauty to the world.

I once found on July 15 a case glued to a fern leaf, and noticing a series of fine holes around the glued end I opened it and discovered the larva in position

for change to pupa, but lying against its middle the pupa of a hymenopterous parasite of a uniform light amber color with deep amber eyes and about 1.75 mm. long. Five days later I noted change in color and discovered that the body of the *Chlamys* larva was simply crammed with similar hymenopterous pupae, twenty-three in all; three days later they emerged, but unfortunately were never determined and are now lost. When the pupae had gained their color, however, the dorsal portions of the abdominal segments were very dark brown, almost black, with a few indistinct transverse yellowish streaks and a similar streak across the thorax just behind the head; there are three ocelli in a row on the top of the head between the eyes; the hind legs just reach the tip of the abdomen but the other legs, like the hind legs appressed to the sides of the body, are short.

Other larval cases similarly attacked were found where the parasites had left the case ragged at the end opposite to the glued part where they had made their escape.

There are apparently at least two broods of this beetle which I have found in the latter part of July and in the latter part of August and early in September. Probably the beetles hibernate. (Notes taken in 1859-1861.)

The larva and its case are figured by Riley (*Rep. ins. Missouri*, vi, fig. 37 on p. 130).

A PARASITE OF THE FALL WEB-WORM.

BY C. H. TYLER TOWNSEND, LAS CRUCES, N. M.

In this vicinity the cottonwoods (*Populus fremontei*) begin to be infested with the Fall Web-worm (*Hyphantria cunea*) about the first of July. On July 28 I placed an entire nest of good-sized web-worms in a breeding cage. Aug. 19 quite a number of moths had emerged, and one specimen of the Tachinid parasite described below. The earth was full of the web-worm cocoons and pupae, only a few stray ones having been formed in the leaves and twigs. The moth is the pure, snow-white form, with the thighs yellowish. Aug. 25 three more specimens of the Tachinid were secured. The following is a description of the latter.

Meigenia hyphantriae n. sp. ♂. Silvery-cinereous, and black. *Eyes* dark brown, extending not quite so low as the vibrissae, thinly hairy on lower portions; front at vertex about one-third the width of head, a little wider at base of antennae, somewhat prominent, silvery on sides with a cinereous shade; frontal vitta narrow, not one-fifth the width of front, dark brown, the prongs on sides of ocelli rather faint, ochreous; frontal bristles moderately strong, three posterior ones inclined backward, others inward, decussate except the divergent lower ones which extend as far down as base of third antennal joint; two orbital bristles on each side; face and cheeks silvery, face strongly receding, facial depression rather wide, facial ridges bristly for some distance above the vibrissae which are decussate and inserted considerably above the oral margin;

sides of face moderately wide, bare; cheeks moderately narrow, bare, except bristles on lower border; antennae a little shorter than face, first two joints rufous, first joint very short, second slightly elongate, third narrow, black, rufous at base, about three times as long as the second; arista black, microscopically pubescent, rather long, thickened for one-third its length, apparently 2-jointed, the second joint short; proboscis rufous, but little extended, fleshy, apparently very short, labella large, flavous or rufous; palpi well developed, slender, nearly cylindrical, flavous or rufous, black hairy; occiput gray or cinereous, with whitish hair, except a wide black vitta from vertex to center, orbital margins fringed with black bristles. *Thorax* narrower than head and abdomen, widest in front, silvery, shaded with cinereous above, with two narrow well-defined black vittae and a lateral interrupted one, bristly and hairy; scutellum cinereous, with an apical very short, weak, decussate pair of bristles, a sub-apical decussate pair of macrochaetae extending to base of third abdominal segment, two lateral and a discal pair of macrochaetae; humeri and pleurae silvery, bristly. *Abdomen* rather conical in outline, short, stout, first segment a little shortened, macrochaetae only marginal; first segment black, without macrochaetae; second and third broadly silvery at base, blackish on posterior border; second with a median pair of macrochaetae, and a single lateral one; third with eight macrochaetae; anal more yellowish at base, armed with macrochaetae and bristles above and below. *Legs* black, coxae and femora silvery, tibiae slightly so, femora and tibiae bristly, hind tibiae with a fringe of bristles on outer edge; claws and pulvilli a little elongate. *Wings* rather broad, longer than the abdomen, without

costal spine, grayish-hyaline, opaque gray at base; apical cell very narrowly open at some distance before the apex of the wing; fourth vein bent at an angle without stump or wrinkle, the bend not sharp, apical cross-vein a little concave; hind cross-vein curved, nearer to bend of fourth vein; third vein spined at base; tegulae white, halteres yellowish gray.

♀. Differs as follows: Front nearly one-half the width of head; frontal vitta broad, occupying one-third of frontal width; three orbital bristles (on one side, on the other side only two); eyes more distinctly hairy, especially on upper portions; claws and pulvilli hardly shorter.

Length of ♂ 6 mm.; wing 5½ mm. ♀ 7 mm.; wing 6 mm.

Described from three ♂ specimens, and one ♀, bred from chrysalids of

Hyphantria cunea, Las Cruces, New Mexico. This species is best located in Meigenia. The face, however, is not almost perpendicular, the abdomen is short and stout, and the macrochaetae are only marginal unless on the anal segment. It cannot be referred to *Mystacella*, which has the eyes more decidedly hairy.

Note on Phorocera promiscua Towns. Psyche, v. 6, 84. This species was wrongly referred to *Phorocera*, my reason for the reference being that the facial ridges are bristly for fully half their extent. But the eyes are very indistinctly hairy, the species agreeing in this and its other characters with *Meigenia*. It will be best, I believe, to refer to it as *Meigenia promiscua* Towns.

NOTES ON BOMBYCID LARVAE.—III.

BY HARRISON G. DYAR, NEW YORK, N. Y.

SCHIZURA EXIMIA Grote.

1882. *Oedemasia eximia* Grt., Bull. U. S. geol. & geog. surv. terr., Hayden, 6, 275.

1891. Thaxter, Can. ent., XXIII, 34.

I have for some time considered this species improperly referred to *Oedemasia*, but I have never found the larva. Dr. Thaxter, however, has bred it, and writes me as follows: "*Oedemasia eximia* resembles *Coelodasys leptinoides** in coloring, but structurally is perhaps more like *biguttatus (ipomeae)*. When at rest it is greatly hunched anteriorly, and the furcate prominence on segm. 4 is very long. I should say it was surely a *Coelodasys*" (= *Schizura*).

I would place it next to *S. leptinoides* and near *Ianassa*.

SCHIZURA BADIA Packard.

1864. *Oedemasia badia* Pack., Proc. ent. soc. Phil., III, 361.

* Described in Ent. amer., vol. 6, p. 230.

Larva. I have found this larva on *Viburnum lentago*, and it is certainly not an *Oedemasia*. It is without the red hump and black tubercles of *O. concinna*, the body being smooth, with dorsal processes on the 1st, 4th, and 8th abdominal segments; the sides of the thoracic segments are green, but the usual V-shaped mark is, I believe, absent. I have not been able to obtain the larva recently for more careful description.

OEDEMASIA SALICIS Hy. Edw.

1876. *Heterocampa salicis* Hy. Edw., Proc. Cal. acad. sci., VII, 121.

Larva. Third stage. Head black, with a few short hairs; cervical shield bisected, black, as is the anal plate. Body yellow, with short pale hairs growing from black tubercles; joint 5 has a slight dorsal hump somewhat orange tinted, and with four smooth black tubercles, these being part of a

transverse row of eight which each segment bears; joint 13 has a double row. The tubercles are not exactly in line, the two dorsal ones being placed anteriorly to the others. Faintly indicated geminate subdorsal and lateral brown lines; thoracic feet dark; length 12 mm.

Fourth stage. Head mahogany red more or less shaded with black; furnished with short hairs; jaws black. Body yellow, a single dorsal and geminate subdorsal, and lateral interrupted pale brown lines. Black tubercles as in the previous stage, but more elongated, the dorsal ones on the hump and the subdorsal ones on joints 3 and 4 especially so. There is also a slight hump on joint 12 with two elongated tubercles. Besides the four tubercles on each side are two more above the bases of the legs. The lines are obsolete behind joint 11, and the arrangement of the tubercles is confused. Cervical shield elevated, bisected; feet and anal plate black. Venter pinkish. The anal pair of feet are held elevated.

As the stage advances the geminate brown lines become filled in with white, and a narrow, interrupted brown line appears between the dorsal and subdorsal lines and between the subdorsal and lateral lines. The hump on joint 5 has a decided rose tint.

Fifth stage. As in the preceding stage, but the black tubercles are still more prolonged, especially the subdorsal ones and the dorsal on joint 5. The hump on joint 5 is rose color, that on joint 12 yellow; the lines are black, except those that last appeared, which are brown, the geminate ones filled in with white, and all interrupted at the humps and obsolete on joint 13. Anal feet yellow, black at their bases.

Food plant. Maple (*Acer*). Larvae from the Yosemite Valley, California, in August.

I did not succeed in obtaining any moths from these larvae, as the stage ride out of the valley was more than they could endure; but, from a comparison with Mr. Edwards' de-

scription, there is no doubt that they are *O. salicis*.

This species is the California representative of the Eastern *O. concinna* Sm. Abb., but seems specifically distinct.

HETEROCAMPA GUTTIVITTA Walker.

1855. *Cecrita guttivitta* Walk., Cat. Brit. mus., V, 992.

1890. *Cecrita guttivitta* Packard, Proc. Bost. soc. nat. hist., XXIV, 543.

Larva. Closely allied to *Heterocampa binudata* Walk., which I have elsewhere described.* Dr. Packard has described the present species, but the larvae that I have seen do not agree with his description. I give the last two stages.

Fourth stage. Head higher than wide, conoidal in outline, flat in front; pale greenish, a curved band from the vertex to antennae dark crimson, centered with and bordered posteriorly by whitish. Labrum and antennae yellow; jaws red brown; width 2.1 mm. Body thickest at joint 8 when at rest; feet normal, the anal pair elevated; on the anterior edge of joint 2 is a yellow line containing two brown points, which apparently represent horns of a previous stage. (In *H. biundata* the horns are present at this stage.) A narrow white dorsal line, edged with black on joints 2 and 3, obsolete on joint 13; a yellow, subdorsal line fading out anteriorly on joint 3, edged inwardly with dark brown on joints 12 and 13, and with white outwardly on the anal plate, narrowly and obliquely interrupted on the anterior part of joint 11. Between these two lines on each side is a supplementary dorsal line, which starts from the dorsal line on joint 5, and, running parallel to it, joins it again on joint 8, immediately leaving it and running to the subdorsal line which it joins on joint 11, just posterior to the interruption. Faint traces of a yellow stigmal line. The green of the

* By error as *H. subrotata* Harv., Ent. amer., VI 209.

body is speckled with small black spots on the sides and on the back of the anterior segments. Feet yellowish, the anal pair white with a narrow, longitudinal black line, and tipped with yellow.

Fifth stage. Width of head 3.3 mm. Vertical lines geminate, somewhat pulverulent on a white ground; color green, labrum whitish, mouth parts purple-red; ocelli black; cervical shield narrowly yellow in front, smooth, without tubercles.* The body is marked as before, the dorsal lines white, the subdorsal yellow, the stigmatal absent. In one example the lines were partly obsolete especially in the fourth stage. As the present stage advances white shades appear in the space enclosed by the anterior supplementary dorsal lines and below the subdorsal line on joint 13 while the subdorsal line becomes partly white. The lateral region of the body is dark green with purple dots, the dorsal region yellowish green with a general faint white shading. On one, a pink spot appeared in the subdorsal band on joint 7.

Cocoon. The larvae enter the ground and spin an extremely slight web of silk.

Pupa. Of normal shape, cylindrical, the body punctured and cases creased; antennae cases prominent. The cremaster consists of two parallel spines, twisted a little near the end and barbed, each bearing two little spurs the anterior one pointing inward, the posterior one outward. A curved row of six sub-cubical granulations is situated at the posterior edge of the thorax. Color shining mahogany red, darker on the cases. Length 19 mm; width 5 mm.

The species is occasionally double-brooded and the winter is passed in the pupa state.

Food plants. Oak (*Quercus*), Witch-hazel (*Hamamelis*), Hickory (*Carya*), Chestnut (*Castanea*) and Birch (*Betula*).

Larvae from Dutchess and Ulster counties, N. Y.

DRYOPTERIS ROSEA Walker.

1855. Walk., Cat. Brit. mus., V, 1164. *Drepana*.

1887. Grote, Can. ent., XIX, 50.

1888. Dyar, Ent. amer., IV, 179.

1890. Packard. Proc. Bost. soc. nat. hist., XXIV, 489.

This species is double brooded. The moths of the first brood appear about the middle of June and from eggs laid by them the summer larvae are produced which develop into moths towards the end of August. The second brood of larvae hibernate exposed on the stems of the food plant in the fourth or fifth larval stages and complete their transformations in the following spring, emerging as perfect insects in June. There appear to be six stages.† There is not much change in coloration except that during hibernation the color is of a uniform brown, resembling the color of the twigs of the food plants, and at maturity it is very variable, often decidedly greenish, resembling the leaves upon which the larvae rest. I have already noted how the larvae are protected from observation in their early stages.

The cocoon is formed of silk inside of the rolled edge of a leaf.

The pupa is cylindrical, a little flattened ventrally; eyes and wing cases prominent; blunt at both ends, the head almost square; the abdominal segments not tapering but the last square and blunt. Cremaster a short thick rounded prominence which is smooth. The body is punctured dorsally, the wing cases finely creased. Color brownish yellow, the head, thorax and anal segment heavily shaded with blackish brown while the cases and back are also shaded, but less heavily. Eyes black; spiracles dark brown. Length 11 mm.; width 4 mm.

Food plants — *Viburnum acerifolium*, *V. lentago* and *V. dentatum*.

Not uncommon on its food plants in Dutchess and Ulster Counties, New York.

* Differing markedly from Dr. Packard's description.

† See Psyche, vol. 5, page 421.

BIBLIOGRAPHICAL NOTES.—I.

BY SAMUEL HENSHAW.

BIOLOGIA CENTRALI-AMERICANA. — DIP-
TERA. Vol. I. By Charles Robert von Osten
Sacken.

	gen.	sp.
Cecidomyiidae, 1886, pt. 49, p. 1.	1	1
Mycetophilidae, 1886, pt. 49, p. 1-2.	3	6
Bibionidae, 1886, pt. 49, p. 2-5.	3	22
Simuliidae, 1886, pt. 49, p. 5.	1	3
Blepharoceridae, 1886, pt. 49, p. 5.	1	1
Culicidae, 1886, pt. 49, p. 5-6.	2	5
Tipulidae, 1886, pt. 49, p. 6-20.	12	38
Rhyphidae, 1886, pt. 49, p. 20-22.	1	1
Stratiomyidae, 1886, pt. 49-50, p. 22-43.	27	92
Tabanidae, 1886, pt. 50-51, p. 43-60.	8	74
Chironomyzidae, 1886, pt. 51, p. 60.	1	1
Leptidae, 1886, pt. 51, p. 60-62.	3	13
Xylophagidae, 1886, pt. 51, p. 62-63.	1	2
Acanthomeridae, 1886, pt. 51, p. 63-68.	2	3
Mididae, 1886, pt. 51-52, p. 68-73.	2	17
Nemestrinidae, 1886, pt. 52, p. 73-74.	2	3
Bombyliidae, 1886-87, pt. 52-55, p. 75-162.	24	107
Therevidae, 1887, pt. 55, p. 162-163.	2	7
Cyrtidae, 1887, pt. 55, p. 163-167.	6	8
Asilidae, 1887, pt. 55-57, p. 167-213.	39	167
Dolichopodidae, 1887, pt. 57, p. 213-214.	4	12
Empididae, 1887, pt. 57, p. 214-216.	2	10

The above enumeration of 147 genera and 593 species includes, in addition to those contained in the descriptive part of the work, all previously recorded from Mexico and Central America.

Species of the following genera are figured:—

Tipulidae. — Epiphragma, 1. *Tany-
prema, 1.

Stratiomyidae. — Hermetia, 1.

Tabanidae. — Chrysops, 1. Tabanus, 1.

Acanthomeridae. — Acanthomera, 3.

Bombyliidae. — Anthrax, 2, 3. Aphoban-
tus, 3. Argyramoeba, 2. Eclimus, 3. Exo-

prosopa, 1. Hyperalonia, 1, 2. *Isopenthes,
2. *Lepidanthrax, 2. Pantarbes, 3. *Stonyx,
2.

Cyrtidae. — Ocnaca, 3.

Asilidae. — *Cophura, 3. Diogmites, 3.
Laphria, 3. Lastaurus, 3. Mallophora, 3.
Proctacanthus, 3.

The three plates contain 66 figures of 50 species; new genera are marked (*); the figure following the name of the genus denotes the number of the plate.

CLOUDS OF INSECTS.

On the night of Aug. 27th, Hornellsville, N. Y., was visited by a vast shoal of insects which came from the south, and, as long as observed, moved in a northerly direction. They made their appearance about sunset and on the following morning they had entirely disappeared. They were minute in size, possessed four membranous, glossy wings, and the abdomen was separated from the thorax by a narrow constriction. They probably belonged to the same order as the bees and wasps. The afternoon preceding the evening of their appearance was sultry and oppressive, and the sky was unclouded. Just before dusk a vast mound-like cloud became visible south of the city. It had an apparent altitude of about two thousand feet and was of the cumulus type. It shone with a rosy, semi-metallic lustre due to reflections from the western sky. A few minutes later the insects began to come from the direction of the cloud. It would be impossible to estimate their numbers. Probably there were at least hundreds of millions. There were places where they flew as thick as hail, and like hail in a common direction. When they had fully arrived the electric lights became the chief centres of their activity. They swarmed the stores and flew about the lights until exhausted, when they fell to the floors in such numbers that they were swept up by the merchants.

Hornellsville is situated in a valley extending approximately north and south. Now

one remarkable fact about this occurrence was that these insects occupied a limited belt in the centre of the valley, and did not extend to the elevated portions of the town on either side. There were no insects about the electric lights on the hillsides, and farther down in the valley the lights were frequented only by *Lepidoptera*. Where the small insects were most abundant the *Lepidoptera* were wanting. Probably the small insects drove them away. Looking from the hillsides a cloudy phosphorescence was seen to extend over the city in an irregular sheet, with here and there patches and protuberances rising high above the common mass. Comparing the position of this cloud at different times from seven until ten o'clock, it was evident that the centres of maximum density were moving northward, i. e., in the same direction that the insects moved in the early part of the evening. There was no perceptible moisture in the air so that this cloud could not be attributed to mist. It must have been caused by the reflection of the city lights upon the glossy wings of these insects.

Prof. D. A. Saunders tells me that a very similar cloud passed over Alfred Centre, a village about twelve miles southwest of Hornellsville, on the evening of August 16. The insects in this case were flying ants with deciduous wings, so that, after the cloud had passed, their wings were found very abundantly scattered over the ground. This cloud made its appearance about sunset and had passed over by dark. It came from a steep hill overlooking the town and swept across the town in a narrow belt, leaving the upper and lower parts unmolested. He has observed other clouds during the year in Florida, and says the inhabitants there are quite familiar with them. A rather remarkable cloud of this kind was particularly observed by him in the month of May at Sisco, Fla. The insects on this occasion were large, and had very glossy wings. The cloud began about eight o'clock in the morning and lasted

for half an hour. They seemed to rise from a fiat meadow densely overgrown with grass. They ascended to an altitude of about twenty feet, and continued the rest of their course in a horizontal direction. The cloud seems to have been confined chiefly to a twenty-acre lot and did not pass to adjacent parts. It was a warm, bright day, and the reflection of light upon their wings gave the cloud a striking resemblance to a snowstorm. Their wings were deciduous, and neighboring pools were pretty much covered with them.

J. LAWTON WILLIAMS.

NOTES.—The Royal Society of New South Wales offers a prize of the Society's medal and £25 for the best essay containing the results of original research on the injuries occasioned by insect pests upon introduced trees, the essay to be sent in before May 1, 1893. The competition is in no way confined to residents in Australia, but is open without restriction to all.

In Nature Notes for August Mr. R. T. Lewis, on the authority of a correspondent in whose trustworthiness he has entire confidence, gives a curious account of the appreciation with which the song of the Cicada is heard by insects other than those of its own genus. The correspondent has frequently observed in Natal that when the Cicada is singing at its loudest, in the hottest portion of the day, it is attended by a number of other insects with lovely, gauze-like, iridescent wings, whose demeanour has left no doubt on his mind that the music is the attraction. The Cicada, when singing, usually stations itself upon the trunk of a tree with its head uppermost, and the insects in question, to the number sometimes of fifteen or sixteen, form themselves into a rough semicircle at a short distance around its head. During a performance one of the insects was observed occasionally to approach the Cicada and to touch it upon its front leg or antennae, which proceeding was resented by a vigorous stroke of the foot by the Cicada, without,

however, any cessation of its song. The insects composing the audience are extremely active; and so wary that they take flight at the least alarm on the too near approach of any intruder. Some of them, however, have been captured; and on examination these "proved to belong to the same family as that most beautiful of British insects—the lace-wing fly, which, indeed, they closely resemble except as to size, their measurement across the expanded wings being a little over two inches; they have since been identified by Mr. Kirby at the British Museum as *Nothochrysa gigantea*."—*Nature*.

PROCEEDINGS OF SOCIETIES.

CAMBRIDGE ENTOMOLOGICAL CLUB.

10 October, 1890.—The 155th meeting of the Club was held at 156 Brattle St. Mr. S. H. Scudder was chosen chairman.

The meeting was devoted almost entirely to informal remarks. Among other topics Mr. S. H. Scudder discussed further damage by white ants in New England. Referring to remarks made by him at a previous meeting on the injuries to geranium cuttings in the forcing houses attached to Mt. Auburn cemetery, and to an article in the Canadian entomologist, by Dr. H. A. Hagen, on their abundance in Cambridge, he proceeded to describe the injuries done by *Termes flavipes* to tree ferns growing in tubs at the Botanic Garden in Cambridge, as well as to the tubs themselves. This had been pointed out to him by Mr. F. A. Quinn and Mr. Cameron of the Botanic Garden. He suggested the practicability of using staves for the tubs made of galvanized iron, or some such material, in place of wooden ones. (See *Psyche*, 1891, v. 6, p. 15.)

Mr. Scudder also called attention to the issue of a work on the genus *Ornithoptera* by Robt. H. F. Rippon.

Mr. J. H. Emerton exhibited a few sketches of *A. polyphemus* in process of expansion.

12 DECEMBER, 1890.—The 158th meeting of the Club was held at 156 Brattle St. Mr. S. Henshaw was chosen chairman.

Mr. Henshaw read a letter from Mr. Mann in relation to vol. 4 of *Psyche*, action on which was necessarily postponed on account of the absence of a quorum.

Mr. S. H. Scudder read the first of a series of letters from Dr. T. W. Harris to Mr. Thos. Say, and the latter's reply. These letters will be published later in *Psyche* (See v. 6, pp. 57-60).

9 JANUARY, 1891.—The 159th regular meeting and 15th annual meeting (since incorporation) was held at 156 Brattle St. Mr. S. H. Scudder was elected chairman.

The annual reports of the secretary and of the retiring librarian were accepted and ordered to be placed on file.

The annual report of the treasurer was presented and referred to the auditors.

Owing to the absence of a quorum the regular election of officers was postponed.

Mr. S. H. Scudder then read the annual address of retiring President Woodworth. The address was entitled "On the relations between scientific and economic entomology," and will be published in full in *Psyche* (See v. 6, pp. 19-21).

Mr. Scudder stated that by request of Mr. F. Bolles he had recently examined the contents of the stomach of three golden winged woodpeckers (*Colaptes auratus*) which he found to consist almost entirely of the remains of ants of several species. Considerable discussion followed with regard to the insect food of several other birds, notably the English sparrow (*Passer domesticus*) and also the kingfisher (*Ceryle alcyon*) and killdeer and golden plovers. It seemed to be the general opinion that insects eaten by birds would be better preserved, owing to the chitine in their composition, than seeds, berries, and other more soluble material, so that when a bird had eaten any insects, unless it was shot immediately after its meal, the insect remains would appear in excess.

The second letter from Dr. Harris to Mr. Say, and the latter's reply was read (See *Psyche*, v. 6, pp. 121-123).

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PSYCHE.

SOME OLD CORRESPONDENCE BETWEEN HARRIS, SAY AND PICKERING.—V.

[HARRIS TO SAY.]

MILTON, May 15, 1825.

DEAR SIR,

By the enclosed letter you will see that I had not neglected to *write* in reply to yours of January last, though I have delayed to send my answer until this time.

I regret that unforeseen obstacles have occurred, which will prevent my contemplated visit to Philadelphia this spring, and that I must relinquish, for the present, my project of consulting you in person respecting a description of the insects of this vicinity.

My collection contains nearly all the native species that are to be found in the cabinet of Prof. Peck, besides many others which are not there. I have also in keeping a small case of insects, collected near Boston by a friend. From these it was my intention to have selected, for your examination, specimens of all those which I had not already sent you; in order both to indicate to you what species were natives of the environs of Boston, and to inform myself by what names they had been described. Although disappointed in my wish of exhibiting these to you in person, I cannot feel contented to remain in my present state of ignorance,

and perhaps incur the risk of publishing, as nondescripts, insects which you or other late entomologists have already described. I will therefore encroach still further on your goodness by sending the case containing these insects for inspection at your leisure, if any you can afford from the various pursuits in which you are engaged. I shall wait until I hear from you before I presume to put your goodwill & patience to this test; and, if your answer be favorable to my wishes, I will forward them by water, to be returned in the same way when you have completed your examination of them. I would not request this of you were not many of the species unique specimens, or such as are entrusted to me by my friend. Those, of which I have duplicates, I shall distinguish in a particular manner, & shall beg of you to retain, if desirable.

I have received from Northampton, (a town in Mass. on Connecticut River) an insect which I presume to be the *Cremastocheilus castaneæ* of Knoch. In the month of September last great numbers appeared on a hill in that town which is wooded with Chestnut trees. The specimen is nine twentieths of an inch long, & nearly 5 twentieths of an inch across the humeral portion of the elytra. It is entirely black, scabrous,

slightly pilose, & with two conspicuous tufts of short hairs on the posterior part of the thorax.

There has been discovered in the state of Maine a species of the genus *Condylura* of Illiger, which presents characters distinct from those of the two species which have been described by naturalists. This animal has the teeth of the *Condylura* (*Sorex*) *cristata*, but not the knotted tail of that species. This species I have examined, & prepared an account of it, for the Boston Journal of Philosophy & Arts, & have called it *Condylura prasinata*. Colour green: Length from end of the snout to origin of the tail $4\frac{1}{2}$ inches: Length of tail 3 inches: circumference of the tail ($\frac{3}{4}$ inch from its insertion) $1\frac{1}{2}$ inch. Caruncles on the nose 22 in number, the two intermediate superior ones united at base, & situated a little anterior of the rest. On each of the phalanges of the fore-feet 3 acuminate, triangular scales or cuticular processes, situated on the inside, near the metacarpo-phalangeal articulation. Tail nearly three quarters as long as the body, strangulated at its insertion, becoming abruptly very large, & tapering toward the extremity. The caudal vertebræ not distinguishable through the mass of fat with which they are enveloped: No transverse folds or ridges on the tail, its surface being perfectly uniform, & the hairs, with which it is thinly clothed, are not disposed in whorls. Such a structure of the tail shews the inaptitude of the generic name *Condylura*. Please inform me

whether this species has fallen under your observation, & how you think it would answer to propose for it the generic name of *Astromycter*, from *αστηρ*, a star, & *μυκτηρ*, the proboscis.

Is the cabinet of Mr. Melsheimer now in existence? and have any descriptions been published of the insects, to which he has given names in his catalogue? (Of course I except yours in the Journal Acad. Nat. Sc.) The catalogue can be of no service without such descriptions, or access to the original specimens.

I wait with pleasant anticipations for the appearance of your second volume of American Entomology, and for your promised account of the Coleoptera, in the Journal of the Acad. Nat. Sc.

Please let me hear from you soon; & allow me to express, for your success in all your undertakings, the best wishes of

Your much obliged friend,

T. WM. HARRIS.

[DRAFT OF REPLY BY THOMAS SAY.]

May 21, 1825.

DEAR SIR,

As you have asked my opinion relative to the *Condylura*, I think it my duty to return you an answer without delay, in order to apprize you that you have no time to lose in publishing an account of your species, as a person here is about to publish what he calls a Fauna Americana in which I suppose this animal will be included. Are you sure it is a

distinct species & not the female of the *cristata*? I should have given an account of it long ago if I had been satisfied on this point, which, however, I do not suppose would deter the author of the expected Fauna Americana. If you have found a male having the swelled tail you are perfectly safe, & I should be glad to see your account of it.

It is true that the generic name is an improper one, but I do not think it ought to be changed; Desmarest complains of the name but he observes that he is afraid d'introduire une nouvelle denomination, & de contribuer ainsi à compliquer la synonymie.

My concerns here are so numerous that I cannot at present devote as much time to nat. hist. as I could wish, I must therefore defer a further answer to y'r letter for a future opport'y.

In the *cristata* the hair has been incorrectly stated to be in whorls, Desmarest notices this error. It has 22 caruncles on the nose. This author's fig. of *cristata* is very good (Jour. de physique, for Sept'r 1819) he relies on Illiger's acumen in placing the *Talpa longicaudata*, Gmel. Long tailed mole of Pennant in this genus, but that species cannot be yours.

A TACHINID PARASITE OF THE OAK UNICORN PROMINENT.

BY C. H. TYLER TOWNSEND, LAS CRUCES, N.M.

The following Tachinid, which I describe from four male specimens, was reared from *Schizura unicornis* Sm. & A. by Mr. F. A. Marlatt, at Manhattan, Kans. It has been bred by him, as he writes me, every year for several years past. The specimens are labelled: "From Oak Unicorn Prominent, Ks. Oct."

Masicera schizuræ n. sp. ♂. Black, cinereous. *Eyes* brown, bare; front about one-third the width of head, a little narrower at vertex than before, rather prominent, cinereous, with a brassy tinge; frontal vitta dark brown or blackish, about one-third the frontal width; frontal bristles descending a little or considerably below base of third antennal

joint, some short hairs outside them and on ocellar area; sides of face silvery, bare; face receding, facial depression with a golden tinge, cinereous on the sides of depression; facial ridges with a row of bristles extending nearly or fully half way up the face; vibrissæ decussate, inserted nearly on the oral margin; cheeks almost wholly invaded by occipital area, cinereous, black hairy, with row of bristles on lower border; antennæ a little shorter than the face, black, second joint not elongate, bristly before, third joint about four times as long as the second; arista rather long and slender, a little thickened on its proximal half, microscopically pubescent, distinctly jointed at base (in one slightly immature specimen distinctly 3-jointed under a high-power lens), black; proboscis short, fleshy, brownish, with large labella;

palpi well developed, club-shaped, yellow with a reddish tinge, black bristly; occiput cinereous, thickly gray hairy, a bare black band extending from vertex to center, and the orbital margins with a fringe of black bristles. *Thorax* cinerous, with four black vittae, hairy and bristly, pleurae silvery; scutellum blackish at base, the apical portion broadly pale ochereous, sometimes almost wholly ochereous, with a short apical decussate pair of bristles, a sub-apical pair of macrochaetae more or less decussate and reaching the base of third abdominal segment, a discal pair, and two lateral pairs. *Abdomen* rather broad, ovate, covered with short bristles; first segment black, a little abbreviated, the other segments broadly or almost wholly silvery at base with hind borders and median vitta shining black, second segment more or less broadly reddish on sides (an immature specimen has the abdomen almost entirely pale reddish); first two segments without macrochaetae, except a lateral marginal one on second segment, but sometimes a median marginal pair also on second segment; third segment with about ten marginal, four to six of which are on upper side; anal segment armed with

marginal macrochaetae and bristles; venter largely silvery, the segments black posteriorly. *Legs* black, femora and tibiae slightly silvery, femora bristly, middle tibiae with some strong bristles, the hind tibiae ciliate on outer edge with a longer bristle beyond middle and two before tip; claws and pulvilli very long, pulvilli smoky whitish. *Wings* much longer than abdomen, rather broad, without costal spine, grayish hyaline, hardly brownish on costo-basal portion, third vein slightly spined at base; apical cell open, ending distinctly before tip of wing; fourth vein bent in a short curve, without stump or wrinkle, apical cross-vein bowed inward; hind cross-vein more or less curved, much nearer the bow of fourth vein; tegulae watery-white, halteres fuscous.

Length 8.5 to 9 mm.; of wing 7.5 to 8 mm.

Described from four specimens. Kans. This species would belong in Brauer and v. Bergenstamm's genus *Argyrophylax*, which is separated from *Masicera* almost solely on the character of the ciliate hind tibiae.

A LIST OF SOME OF THE CATALOGUES AND LOCAL LISTS OF NORTH AMERICAN COLEOPTERA.—II (H.-P.).

BY JOHN HAMILTON AND SAMUEL HENSHAW.

33 **Haldeman**, S. S. Catalogue of the carabideous Coleoptera of southeastern Pennsylvania. (Proc. acad. nat. sci. Phil., 1843, v. 2, p. 295-298.)

210 species are listed.

34 **Harrington**, W. H. List of Ottawa Coleoptera. (Trans. Ottawa field nat. club, 1884, v. 2, p. 67-68.)

1022 species and varieties are listed; the occurrence of about 100 additional species is noted.

35 **Harrington**, W. H. Additions to Canadian lists of Coleoptera. (Can. ent., 1884, v. 16, p. 44-47; 70-73; 96-98; 117-119.)

122 species are listed; a few are not fully identified.

36 **Harrington**, W. H. On the lists of Coleoptera published by the geological survey of Canada, 1842-1888. (Can. ent., 1890, v. 22, p. 135-140; 153-160; 184-191.) Separate; 21 p.

The short lists published in the reports of the Canadian geological survey are here collated; 482 species and varieties are enumerated.

37 **Harris**, Thaddeus William. Insects. Hitchcock's Report on the geology, etc., of Massachusetts. Amherst, 1833. Second edition; Amherst, 1835. Separate; Amherst, 1835.

The Coleoptera are enumerated on p. 566-583 ed. of 1833, p. 553-575 ed. of 1835 and p. 33-55 of the separate of Edward Hitchcock's Catalogue of the animals and plants in Massachusetts: 994 species are in the list in the separate; many of these are however manuscript names.

38 **Hayward, Roland and Savage, H. A** catalogue of the Coleoptera of the Green Mountains. (Quart. journ. Bost. zool. soc., 1883, v. 2, p. 12-15; 24-29; 36-38.)

431 species and varieties are listed from Camel's Hump and the northern range of the mountains. "*Platynus brunneomarginatus* = *P. tenuicollis*, and *Hister punctifer* and *Hoplia equina* are erroneous determinations" *R. Hayward in litt.*

39. **Henshaw, Samuel.** List of Coleoptera collected in the vicinity of Cliftondale, Mass., June 12, 1873. (*Psyche*, 1874, v. 1, p. 17-18; 22-23.)

135 species are listed.

40 **Henshaw, Samuel.** List of the Coleoptera of America, north of Mexico. Philadelphia, 1885, 2+161 p.

923 species are enumerated; includes all species described till Sept. 1885.

41 **Henshaw, Samuel.** First supplement to the list of Coleoptera of America, north of Mexico. (Entom. amer., 1887, v. 2, p. 213-220.) Separate: Brooklyn, 1887, 8 p.

212 species are added; many corrections in synonymy are indicated; includes all species described till Jan. 1, 1887.

42. **Henshaw, Samuel.** Second supplement to the list of Coleoptera of America, north of Mexico. (Entom. amer., 1889, v. 5, p. 127-138.) Separate: Brooklyn, 1886, 14 p.

303 species are added; bibliographical references to recent monographs, synopses, etc. are added.

43. **Holland, W. J.** Captures made while travelling from Winnipeg to Victoria, B. C. (Can. ent., 1888, v. 20, p. 89-92.)

60 species and varieties of Coleoptera are listed.

44 **Horn, George H.** Catalogue of Coleoptera from southwestern Virginia. (Trans. Amer. ent. soc., 1868, v. 2, p. 123-128.)

179 species are listed, some are not fully determined.

45. **Horn, G. H.** A list of Coleoptera collected by C. Thomas, in eastern Colorado and northeastern New Mexico, during the survey of 1869. (Rep. U. S. geol. surv., [Hayden's 2d rep.], 1872, p. 469-470.)

Enumerates 123 species; 2 are not fully identified.

46 **Horn, G. H.** Coleoptera. (Rep. U. S. geol. surv., [Hayden's 5th rep.] 1872, p. 382-392.)

818 species are enumerated collected in Kansas, Utah, Idaho, Montana, California, Oregon, New Mexico, Nevada and Indian Territory.

47 **Horn, G. H.** Coleoptera. (Rep. U. S. geol. surv., [Hayden's 6th rep.], 1873, p. 717.)

19 species are listed from Yellowstone Lake, 8 from Teton Basin and 13 from Snake River.

48 **Horn, G. H.** Coleoptera. (Rep. sea fisheries New England [Baird's 1st rep.], 1873, p. 540-543.) (Rep. invert. Vineyard Sound, 1874, p. 246-249.)

17 species are listed with notes on localities.

49 **Horn, G. H.** Notes on the coleopterous fauna of Guadalupe Island. (Trans. Amer. ent. soc., 1876, v. 5, p. 198-201.)

23 species are listed; 4 species are peculiar to the fauna of the island; regions of previous occurrence are given.

50 **Horn, G. H.** List of Coleoptera collected in 1875 in Colorado and Utah, by A. S. Packard, Jr., M. D. (Rep. U. S. geol. surv., [Hayden's 9th rep.], 1877, p. 811-815.)

146 species are listed with localities of capture; several are not fully identified.

51 **Horn, G. H.** Coleoptera [collected in 1885, by Dr. Robert Bell, in connection with the Hudson's Bay expedition.] (Rep. progr. Can. geol. surv., 1885, 1886, p. 27 DD.)

5 species are listed from Stupart's Bay, 3 from Cape Chudleigh, 3 from Cape Digges and 3 from Blanc Sablon.

52 **Howard, L. O.** A list of the invertebrate fauna of South Carolina. Separate: 47 p.

Chapter 11 of a Handbook of the state of South Carolina published in 1883 by the state: a list of the genera of the more important families of Coleoptera found in the state is given on p. 11-16; estimates that some 4000 species will probably be found by diligent collecting.

53 **Howard, L. O.** Annotated catalogue of the insects collected in 1887-88 [by the U. S. fish commission steamer Albatross.] (Proc. U. S. nat. mus., 1889, v. 12, p. 185-216.)

A few species of Coleoptera from Clemente Island and from Lower California are listed on p. 186-187.

54 **Hubbard, H. G. and Schwarz, E. A.** The Coleoptera of Michigan. (Proc. Amer. philos. soc., 1878, v. 17, p. 593-666.)

From the Lake Superior region 1231 species and varieties are listed; the occurrence of more than 100 additional species is indicated; from the lower peninsular of Michigan 1786 species and varieties are listed and the occurrence of about 150 additional species is noted; many new species are described by Leconte.

55 **Jones, J. Matthew.** Nova Scotian Coleoptera. Part 1. (Trans. Nova Scotia inst. nat. sci., 1869, v. 2, p. 141-000.) Separate: Halifax, 1870, 15 p.

100 species are listed; very many of them are not fully identified.

56 **Kilman**, Alva H. Additions to the list of Canadian Coleoptera. (Can. ent., 1889, v. 21, p. 108-110: 134-137.)

117 species are listed with notes of capture and abundance.

57 **Kirby**, William. The insects. Richardson's Fauna Boreali-Americana. Norwich, 1837, v. 4.

343 species of Coleoptera are enumerated and described on p. 8-240; contains species collected from Nova Scotia to the Rocky Mountains and northwest to 65°. For a partial reprint of Kirby's descriptions etc. see Can. ent., v. 2-7; also in separate, London, Ontario, n. d., 146-14 p. The synonymy of the Coleoptera by G. H. Horn (Can. ent. v. 8, p. 126-130; 150-159; 166-170; 190-193) is also in the separate.

58 **Knaus**, Warren. Additions to the catalogue of Kansas Coleoptera for 1883 and 1884. (Trans. Kans. acad. sci., 1885, v. 9, p. 57-61.)

148 species and 12 varieties are listed; this raises the total number of Kansas Coleoptera to 2059 species and varieties.

59 **Knaus**, Warren. Additions for 1885 and 1886 to the list of Kansas Coleoptera. (Trans. Kans. acad. sci., 1887, v. 10, p. 86-88.)

60 species and 1 variety are listed; the total number of Coleoptera from Kansas is now about 2115.

60 **Leconte**, John L. A descriptive catalogue of the geodephagous Coleoptera inhabiting the United States east of the Rocky Mountains. (Annals lyc. nat. hist. N. Y., 1848, v. 4, p. 172-474.) Separate: 144 p.

616 species are enumerated: the pages succeeding p. 233 are numbered 100 100 high.

61 **Leconte**, J. L. General remarks upon the Coleoptera of Lake Superior. Agassiz's Lake Superior, Boston, 1850, p. 200-242.*

816 species are enumerated and many of them described for the first time. This collection was made from Sault de Ste. Marie, skirting the eastern and northern shores of Lake Superior and westward to Fort William on Thunder Bay.

62 **Leconte**, J. L. Descriptions of new species of Coleoptera from California. (Annals lyc. nat. hist. N. Y., 1851-52, v. 5, p. 125-216.)

Descriptions of 335 new species from California and Oregon; a few species from other parts of the United States are described in the foot notes.

63 **Leconte**, J. L. Report upon insects collected on the survey. (Rep. expl. and surv. from Miss. river to the Pacific ocean, 1857, v. 12, pt. 3, p. 1-72.) Separate: 72 p.

1173 species of Coleoptera are listed from California, Oregon, Washington and Alaska; a few undetermined species are noted: contains remarks on distribution and the following tables, 1, genera common to the eastern and western continents; 2, genera peculiar to America; 3, species common to the Atlantic and Pacific slopes of the continent; 4, species found in Russian America and in the eastern continent, not introduced and not found in Atlantic America.

64 **Leconte**, J. L. Catalogue of Coleoptera of the region adjacent to the boundary line between the United States and Mexico. (Journ. acad. nat. sci. Phil., 1858, ser. 2, v. 4, p. 9-42.)

993 determined species are listed from Texas, Kansas, Colorado, Arizona, Frontera, Mexico, California, and Lake Superior; the occurrence of 11 additional species is noted; contains the following tables, 1, distribution of genera across the continent; 2, species extending across the continent; 3, genera common to the eastern and western continents; 4, genera peculiar to America.

65 **Leconte**, J. L. Descriptions of new species of Coleoptera, chiefly collected by the United States and Mexican boundary commission, under Major W. H. Emory, U. S. A. (Proc. acad. nat. sci. Phil., 1858, p. 59-89.)

Describes 147 new species from Texas, Sonora and California.

66 **Leconte**, J. L. Catalogue of the Coleoptera of Fort Tejon, California. (Proc. acad. nat. sci. Phil., 1859, p. 69-90.)

147 species are listed; 44 species from the Pacific coast are added as a supplement.

67 **Leconte**, J. L. Additions to the coleopterous fauna of northern California and Oregon. (Proc. acad. nat. sci. Phil., 1859, p. 281-292.)

116 species are listed.

68 **Leconte**, J. L. The Coleoptera of Kansas and eastern New Mexico. (Smithsonian contr. knowl., 1859, v. 11, 6+58 p.) Separate: N. Y., 1860, 6+58 p.

Enumerates 939 species from Kansas and Nebraska and 227 from eastern New Mexico; many of these are not fully identified; contains a map of the entomological provinces of North America.

69 **Leconte**, J. L. Notes on Coleoptera found at Fort Simpson, Mackenzie river, with remarks on northern species. (Proc. acad. nat. sci. Phil., 1860, p. 315-321.)

25 species are listed from Ft. Simpson, followed by notes and descriptions of species from Russian America, Saskatchewan and Oregon.

70 **Leconte**, J. L. Notes on the coleopterous fauna of Lower California. (Proc. acad. nat. sci. Phil., 1861, p. 335-338.)

Notes the occurrence of more than 500 species in Lower California; relations between the fauna of Lower California and that of California, Arizona, New Mexico and Texas.

71 **Leconte**, J. L. New species of Coleoptera inhabiting the Pacific district of the United States. (Proc. acad. nat. sci. Phil., 1861, p. 338-359.)

Describes 66 new species from California, Oregon, Washington, Utah, New Mexico and Kansas.

72 Leconte, J. L. List of the Coleoptera of North America. Part I. (Smithsonian misc. coll., 1863-1866, v. 6, 78 p.) Separate: Washington, 1863-1866, 78 p.

Enumerates 5422 species and 50 races; gives full synonymy.

73 Leconte, J. L. List of the Coleoptera collected in the mountains of Lycoming county, Pa. (Proc. acad. nat. sci. Phil., 1866, p. 347-348.)

151 species are listed; several are not fully identified.

74 Leconte, J. L. List of Coleoptera collected near Fort Whipple, Arizona, by Dr. Elliott Coues, U. S. A., in 1864-65. (Proc. acad. nat. sci. Phil., 1866, p. 348-349.)

88 species are listed; several are not fully identified.

75 Leconte, J. L. List of Coleoptera collected in Vancouver's Island by Henry and Joseph Matthews, with descriptions of some new species. (Annals and mag. nat. hist., 1869, ser. 4, v. 4, p. 369-385.)

186 species are listed.

76 Leconte, J. L. New species of Coleoptera collected by the expeditions for geographical surveys west of one hundredth meridian in charge of Lieut. Geo. M. Wheeler, United States engineers. (Annual rep. chief engineers for 1876, pt. 3, p. 516-520.) (Appendix JJ annual rep. chief engineers for 1876, 1876, p. 296-300.)

Appended to the descriptions are lists of **1**, California Coleoptera. 76 species with localities. **2**, Coleoptera of southern Colorado and northern New Mexico. 224 species.

77 Leconte, J. L. List of Coleoptera. (Rep. progr. Can. geol. surv., 1875-76, 1877, p. 107-109.)

List of 145 determined and 11 undetermined species collected in British Columbia.

78 Leconte, J. L. The Coleoptera of the alpine regions of the Rocky Mountains. (Bull. U. S. geol. and geog. surv., 1878, v. 4, p. 447-480.)

222 species and varieties collected in the Rocky Mountains of Colorado, Wyoming and Utah, at an elevation of 6000 feet and upwards are listed with localities of capture; 30 species are listed as peculiar to the Rocky mountain region and 154 species collected at Atlanta, Idaho (7300') are enumerated; a few of the species are not fully identified.

79 Leconte, J. L. The Coleoptera of the alpine Rocky Mountain regions.—Part II. (Bull. U. S. geol. and geog. surv., 1879, v. 5, p. 499-520.)

659 species and varieties are listed some of which are not fully identified; all were collected in Colorado, Wyoming and Idaho at an elevation of 6000 feet and upward.

80 Leconte, J. L. List of Coleoptera collected by Dr. R. Bell in 1879 on the Nelson and Churchill rivers. (Rep. progr. geol. surv. Can. 1878-79, 1880, p. 65c-66c.)

36 determined and 2 undetermined species are listed.

81 Leconte, J. L. List of Coleoptera collected in 1880 in Manitoba and between Lake Winnipeg and Hudson's Bay. (Rep. progr. geol. surv. Can. 1878-80, 1881, p. 70c-74c.)

Contains the following lists: **1**, from York Factory Hudson's Bay, 23 determined and 4 undetermined species; **2**, from Norway House to Oxford House, 39 determined and 2 undetermined species; **3**, from Lower Fort Garry, Manitoba, 33 determined species; and **4**, from Cross Lake, Nelson River, 35 determined and 1 undetermined species.

82 Leconte, J. L. List of Coleoptera collected in 1881 by Dr. Bell and others in the Lake Superior district and in the north-west territories, east of the 112th meridian and south of the 60th parallel. (Rep. progr. geol. surv. Can., 1880-81-82, 1883, p. 29c-39c.)

Contains the following lists: **1**, from Sault Ste. Marie, between Lakes Huron and Superior, Lat. 46° 31', Long. 84° 20', 96 species; **2**, from mouth of Michipicoten River, Lake Superior, Lat. 47° 56', Long. 84° 51', 9 species; **3**, from head waters of the Michipicoten River, Lake Superior, Lat. 48° 30', Long. 84° 00' to Lat. 48° 30', Long. 84° 10', 28 species; **4**, from Missinaibi House, north-east of Lake Superior, to Flying Post, Lat. 48° 29', Long. 83° 35' to Lat. 45° 02', Long. 82° 20', 18 determined and 2 undetermined species; **5**, from Oba and Kabiukagami lakes and rivers, northeast of Lake Superior, Lat. 48° 30', Long. 84° 27' to Lat. 49° 45', Long. 83° 45', 43 species; **6**, from Thunder Bay to Lake-of-the-Woods, west of Lake Superior, Lat. 45° 25', Long. 89° 10', to Lat. 49° 25', Long. 95° 00', 23 species; **7**, from Oxford House, between Lake Winnipeg and Hudson's Bay, Lat. 54° 53', Long. 95° 44', 67 determined and 2 undetermined species; **8**, from Nelson River House, near Churchill River, Lat. 55° 50', Long. 99° 30', 51 species; **9**, from Cross Lake, on the Nelson River, to Cumberland House on the Saskatchewan, Lat. 54° 40', Long. 98° 00', to Lat. 54° 00', Long. 102° 22', 19 species; **10**, from Cumberland House to Reindeer Lake, Lat. 54° 00', Long. 102° 22' to Lat. 53° 30', Long. 101° 00', 19 species; and **11**, from the north end of Reindeer Lake to the west end of Athabaska Lake, Lat. 58° 30', Long. 101° 00' to Lat. 53° 30', Long. 101° 00', 5 species.

83 Lagger, Otto. List of Coleoptera found in the vicinity of Baltimore. (Johns Hopkins Univ. circ., 1884, v. 3, no. 30, p. 78-79.)

Abstract; number of families (71) genera (837) and species (2259) found in the vicinity of Baltimore, Md.

84 von Mannerheim, Carl Gustav, Graf. Beitrag zur kaefer-fauna der Aleutischen Inseln, der Insel Sitkha und Neu-Californiens. (Bull. soc. imp. nat. Mosc., 1843, v. 16, p. 175-314.) Separate: 142 p.

Enumerates and describes 300 species from California and the Alaskan Islands; many of the species are described as new.

85 von Mannerheim, Carl Gustav, Graf. Nachtrag zur kaefer-fauna der Aleutischen Inseln und der Insel Sitkha. (Bull. soc. imp. nat. Mosc., 1846, v. 19, p. 501-516.) Separate: 16 p.

Enumerates and describes 16 species.

86 von Mannerheim, Carl Gustav, Graf. Zweiter nachtrag zur kaefer-fauna der Nord-Amerikanischen laender des Russischen Reiches. (Bull. soc. imp. nat. Mosc., 1852, v. 25, p. 283-387.) Separate: 107 p.

Enumerates and describes 180 species; also lists the Russian American species of this and previous contributions; excluding the species from California the Alaskan species number 332.

87 von Mannerheim, Carl Gustav, Graf. Dritter nachtrag zur kaefer-fauna der Nord-Amerikanischen laender des Russischen Reiches. (Bull. soc. imp. nat. Mosc., 1853, v. 26, p. 95-273.) Separate: 184 p.

Enumerates and describes 265 species; many of these were enumerated in preceding contributions; eliminating these the number of Alaskan species is 540 according to Mannerheim.

88 Melsheimer, Friedrich Ernst. Catalogue of the described Coleoptera of the United States. Washington, July 1853, xvi + 174 p.

Revised by Drs. S. S. Haldeman and J. L. Leconte; published by the Smithsonian Institution; 4750 species are enumerated; contains all the Coleoptera known till Jan. 1, 1852 with the bibliography and considerable synonymy.

89 Melsheimer, F. V. A catalogue of insects of Pennsylvania. By Fred. Val. Melsheimer Minister of the gospel. Part first. Hanover, York County: Printed for the author, by W. D. Lepper. 1806. vi + 60 p.

1303 species (all Coleoptera) are enumerated; many of the names are catalogue names. This is the first list of American Coleoptera and is extremely rare.

90 Osborn, Herbert and Wictham, H. F. Fragment of a catalogue of the Coleoptera of Iowa. Abstract. (Proc. Iowa acad. sci., for 1887-9. 1890, p. 44.)

239 species are mentioned as included in "the fragment."

91 Packard, A. S., Jr. List of Coleoptera collected by A. S. Packard, jun., at Caribou Island, Labrador, Straits of Belle Isle. (Can. ent., 1870, v. 2, p. 119.)

20 determined and 5 undetermined species are listed.

92 Packard, A. S., Jr. List of Coleoptera collected in Labrador. (4th ann. rep. trustees Peab. acad. sci., 1872, p. 92-94.) Separate: 3 p.

46 determined and 11 undetermined species are listed with localities; the collection was made along the coast of Labrador from Caribou Island to Hopedale.

93 Packard, A. S. List of the spiders, myriopods and insects of Labrador. (Can. ent., 1888, v. 20, p. 141-149.)

54 determined and 9 undetermined species of Coleoptera are listed with localities of capture.

94 Pettit, J. List of Coleoptera taken at Grimsby, Ontario. (Can. ent., 1869, v. 1, p. 106-107; v. 2, p. 7: 17-18: 1870, p. 53-54: 65-66: 84-86: 102-103: 117-118: 131-133: 151: 1871, v. 3, p. 105-107: 1872, v. 4, p. 12-14.)

1225 species are listed; a few of the weevils are not fully identified.

95 Pettit, J. Coleoptera taken at Grimsby. (Can. ent., 1872, v. 4, p. 98-99.)

65 species are added to the previous list.

96 Popenoe, Edwin A. A list of Kansas Coleoptera. (Trans. Kans. acad. sci., 1877, v. 5, p. 21-40.)

1179 species and 30 varieties are listed; about 75 undetermined species are indicated as occurring in the state.

97 Popenoe, E. A. Additions to the catalogue of Kansas Coleoptera. (Trans. Kans. acad. sci., 1878, v. 6, p. 77-86.)

435 species and varieties are enumerated; some are not fully identified.

98 Provancher, L. Liste des coléoptères pris à Portneuf, Québec. (Le nat. canad., 1869, v. 1, p. 232: 255-256: 279-280; v. 2, p. 12: 1870, p. 60-61: 118: 178-179; 249; 271-272: 343: 367-369; v. 3, p. 25-26: 1871, p. 57-59.)

699 species are listed.

99 Putnam, J. D. List of Coleoptera found in the vicinity of Davenport, Iowa. (Proc. Davenport. acad. nat. sci., 1876, v. 1, p. 169-173.)

222 determined and 3 undetermined species are listed.

100 Putnam, J. D. Coleoptera collected at Monticello, Iowa, June 12th, 1872. (Proc. Davenport. acad. nat. sci., 1876, v. 1, p. 173.)

A list of 34 determined and 3 undetermined species.

101 Putnam, J. D. Coleoptera collected near Frederic, Monroe Co., Iowa, August, 1869. (Proc. Davenport. acad. nat. sci., 1876, v. 1, p. 173.)

A list of 19 species.

102 Putnam, J. D. List of Coleoptera collected in the Rocky Mountains of Colorado, in 1872. (Proc. Davenport. acad. nat. sci., 1876, v. 1, p. 177-182.)

236 determined and 24 undetermined species are listed.

103 Putnam, J. D. Report on the insects collected by Captain Jones's expedition to northwestern Wyoming in 1873. (Proc. Davenp. acad. nat. sci., 1876, v. 1, p. 187-191.)

44 identified and 1 unidentified species of Coleoptera are listed from Green River Basin: Fort Bridger; 38 identified and 2 unidentified from Wind River Basin: Stinkingwater River; and 21 species from Yellowstone National Park.

104 Putnam, J. D. Report on the insects collected in the vicinity of Spring Lake Villa, Utah Co., Utah, during the summer of 1875. (Proc. Davenp. acad. nat. sci., 1876, v. 1, p. 193-205.)

From the Mount Nebo alpine region 52 determined and 3 undetermined species of Coleoptera are listed; from Salt mud flat near Utah Lake 38 determined and 1 undetermined and from the Sage brush region 105 determined and 7 undetermined.

HETEROPACHA RILEYANA.

BY CAROLINE G. SOULE, BROOKLINE, MASS.

Eggs laid July 1, 1891, at Columbus, Ohio.

Eggs globular, opaque white mottled with dark green, a dot of green on top.

July 11, 1.30 P.M., they hatched.

Young larvae 1-8 inch long. Head very large, round, horn-colored mottled with brown. Body gray, striped longitudinally with dark brown on each side of the dorsum. 11th segment black on top. Body covered with short, gray hairs. Feet and props gray. Anal props very slender and spread far apart. The body tapered from head to anal end. The larvae moved very fast, and were flat instead of cylindrical.

Three days later they had changed somewhat in color, the head being dull white barred with brown; the body dull white on dorsum with a black dorsal line, and a black dash on each side of this line. From each dash arose a small, dark wart with short spreading hairs. The sides were dark gray with a dull white line from 5th segment to anal props. The hairs were most abundant over the head and feet, and were grayish. Each segment had a few warts, with sparse short hairs.

July 16. *First moult.* Head darker, hairy, mottled with white, the dark and white lines extending back over the first segment, the body, as before, giving the effect of black and white stripes. The tapering from head to

anus was very noticeable, as was the flat, leech-like shape. The hairs were long over the feet, shorter along the stigmatal line, and very short on the sides and dorsum.

July 19. *Second moult.* Length 1-2 inch. Head dark barred with white hairs. Body tan-colored on dorsum with two black dashes on each segment. Lateral and stigmatal lines nearly black. A black patch on top of the 11th segment. Feet and props dark gray. Hairs sparse and short except over feet and props, where they seemed to "fringe" the whole edge of the larva.

July 23. *Third moult.* Length one inch or a trifle less. Head black with two short yellow lines on top, and a yellow spot near the mouth, hairy. Body brown on dorsum, yellow between the segments, with black dashes. Two yellow dashes on 12th segment. No black patch on 11th segment. Lateral and stigmatal lines of black and pale brown. Feet and props dark, overhung by long gray hairs in tufts. Very short hairs on the dorsum, and very sparse.

July 27th. *Fourth moult.* 1 1-2 inches long. Head as before. The body was marked with brown, black, tan, and yellow or white, in a sort of "oil-cloth pattern" very difficult to describe, and varying with individuals. The dorsal hairs were unnoticeable without a lens, but the stigmatal fringe

remained, and the general look of the larvae was like *Tolyte laricis* except in color.

The larvae moved very rapidly, and when at rest lay closely adhering to the twig of honey-locust, so flat as to be inconspicuous. The cast skins seemed to be thicker and more leathery than those of most Bombycid larvae. These larvae drank less than most that I have reared.

Cocoon. Aug. 5. The first one spun a thin parchment-like cocoon, 3-4 of an inch long, oval, slender, of a red-brown color mottled with gray. It spun very slowly, taking over two days.

Pupa. Aug. 11. The pupa was formed. It was 3-4 of an inch long, slender, dark brown, and had a white chalky substance all over it, which fell off when the pupa was touched.

PREPARATORY STAGES OF PHEOSIA DIMIDIATA H.S.

BY HARRISON G. DYAR.

PHEOSIA DIMIDIATA Herrick-Schäffer.

1854—Herr-Sch., Saml. ausser. schmett., p. 66, fig. 515, *Drymonia*.

1882—Grote, New check list, p. 19, *Pheosia*.

rimosa Packard.

1864—Pack., Proc. ent. soc. Phil., v. 3, p. 358.

1877—Lintner, Ent. cont., iv. p. 76 = *dictaea*.

1878—Tepper, Bull. Brook. ent. soc., v. 1, *sp. dist.*

1882—Goodhue, Can. ent. v. 14, p. 73.

1890—Packard, 5th rept. U. S. ent. comm., p. 455, *sp. dist.*

1891—Dyar, Psyche, v. 6, p. 128.

californica Stretch.

1873—Stretch, Zyg. & Bomb. N. A. v. 1, p. 116, pl. 4, fig. 5, larva, pl. 10. *Notodonta*.

1877—Lintner, Ent. cont., iv. p. 76, *pr. syn.*

Egg. Hemispherical, the base flat, smooth, sublustrous, white. Under the microscope it appears closely covered with dense, very small, rounded granulations, which are of about uniform size, but fused into a small white spot at the micropyle. Diameter 1.1

mm. Laid singly, usually on the under side of the leaves of its food-plants. The larva hatches by eating a hole in the side of the egg, but leaves the rest of the shell intact.

First stage. Head slightly bilobed, black and shiny; labrum white; a few hairs; width .6 mm. Joint 12 is slightly enlarged dorsally, otherwise the body is uniformly cylindrical. There is no trace of the caudal horn so conspicuous in the last stage. Body pale white; cervical shield, anal plate and thoracic feet black. From the minute elevated dots arise blackish hairs which are apparently not glandular but pointed at tip. A subventral broken blackish band which later changes to purple. Legs normal, the anal pair not elevated, all black outwardly. Near the end of the stage a purplish patch appears under the skin on joint 12 dorsally in the location of the piliferous dots of row 1, indicating the origin of the caudal horn. The piliferous dots of row 1 are close together on joint 12, more normal on joint 11 and almost in line with those of row 2 on the anterior segments. Row 3 are large, lateral; rows 4 and 5 small; row 6 distinguishable only on the legless segments and row 7 normal, on the venter of the apodal joints. In the latter

part of the stage the body is greenish white. the dots distinct and black.

Second stage. Head large, slightly bilobed, narrowing to the vertex, flattened in front; shining straw yellow, brown on the vertices of the lobes; mouth parts whitish; ocelli black; width 1.1 mm. Body slightly enlarged at joint 12 with a dorsal rounded conical process bearing two divergent setae; otherwise slender. Pale whitish green, the horn dark red brown, not shiny; a faint stigmal yellowish band, bordered below by an interrupted dark red band. Thoracic feet black, the bases of the four anterior pair of abdominal feet black outwardly. The piliferous dots are absent, but the setae remain rather short, fine, blackish. The cervical shield is absent and the anal plate obscure.

Third stage. Head rounded, pale green, not shiny; mouth, antennae and ocelli brownish; a few short blackish hairs; width 1.7 mm. Body cylindrical, with a slight subventral ridge; joint 12 enlarged dorsally and continued into a process like a tapering horn, pointing straight upward, nearly 1 mm. long. Cervical shield and anal plate not distinct, concolorous with the body. Body whitish green, not shiny; an obscure yellowish stigmal shade, below which is a dark red subventral band, somewhat interrupted; feet all dark red. The process on joint 12 is rounded at the tip and bears two minute divergent black setae. Similar setae arise from the obsolete piliferous dots. Spiracles brown, whitish centrally. The segments are faintly transversely creased.

Fourth stage. Head large, flattened in front, very slightly bilobed and uniform yellowish green in color; width 2.4 mm. Body cylindrical, slender, enlarged dorsally at joint 12 and bearing a conical nutant process, 1 mm. long, which bears two small divergent setae before the tip. The other setae on the body are also very minute. Color yellowish green; a substigmal yellowish band and below it a dark red one, staining the bases of the legs. Thoracic feet dark red, the anal

feet green. Spiracles large, white, narrowly ringed with black. The horn is red. As the stage advances the body becomes tinged with purplish except on the sides of joint 2. The spiracles are broadly surrounded by white.

Fifth stage. Head large, rounded, flattened in front, smooth, shiny pea green with a faint brownish tinge and obscurely mottled with little yellowish spots; mouth parts brownish; width 3.8 mm. Body long, slender at first, joint 12 produced upwards into a long conical horn, very thick at base. Anal plate large, nearly circular, but slightly excavated anteriorly with a knob-like elevation in the center and coarsely granulated. The body is at first green with a strong brownish purple tinge, especially in the middle of the segments; joint 2 clear green anteriorly. On each joint centrally a blackish purple transverse shade band, absent on joints 2, 5, and 11, complete on joint 3, tinging the bases of the legs on joint 4, most distinct on the bases of the legs on joints 7-10 and on joint 12 running posteriorly to the spiracle and broadly to the vertex of the horn which is pinkish posteriorly. Anal plate green, with a broad red-brown border. Spiracles large, black, surrounded with white and outside this by a purplish shade, the pair on joint 2 pale with a black border. A broad medio-ventral pale green band. Thoracic feet red-brown.

As the stage advances, the entire head and body become very shiny light purple, except the thoracic feet which are red and the anal plate which is colored as before. The blackish bands and ventral band remain as does also the coloration of the spiracles. There are no setae distinguishable except on the anal feet, but very slight ones can be made out with a lens in certain places. There are two orange spots on the feet on joints 7-10, separated by a black line; the anal feet are orange centrally. Some examples almost entirely lack the black bands except the one on the horn which is always present.

Cocoon. The larvae turn bluish and enter the ground to pupate, forming a cell lined with silk.

Pupa. Cylindrical, rounded at both ends, long in comparison with its width; uniform shiny black. The wing cases are wrinkled. The cremaster consists of two very short spines, some distance apart, and projecting almost laterally from the last segment, which nevertheless hold to the silken web with considerable firmness.

Length 26 mm.; width 8 mm.

Food plants. Poplar (*Populus*) and willow (*Salix*).

Larvae from Yosemite Valley, Cal. Two broods a year, the winter being passed in the pupa state.

TEMPERATURE EXPERIMENTS.

24 Vernon Terrace, Brighton,

10 Sept., 1891.

EDITOR OF PSYCHE, *Dear Sir*:—I have to thank you for the number of *Psyche* containing an abstract of one of my papers on the temperature experiments I have been making on some Lepidoptera. Will you permit me to point out a typographical error which may be misleading. In "general conclusion" no. 5, the figures "7" and "5" have been transferred, making my figures "57°" read as "75°." I may perhaps add that in order to bring out the full deep colouring in the *spring* emergence of *illustraria*, a somewhat lower temperature than 57° seems necessary, though that 57° is very effective. I find both emergences of all three of the English *Selenias* affected by temperature in the pupal stage, in colour, — as to markings I am not yet quite sure as regards *lunaria* and *illunaria*.

I am very glad you have seen fit to publish the experiments in America. I have always thought a country with such an abundance of Lepidoptera and such extremes of heat and cold would be especially productive of materials for such experimentation. Your distinguished naturalist, Mr. W. H. Edwards, has done much, and indeed I have only en-

deavoured to follow in his footsteps and work out results that he has not been able to follow out. We want such experiments also on single brooded species, some of which (e. g. *Ennomos autumnaria*) are certainly affected: and as to these it remains to be ascertained whether Prof. Weismann's theory applies (I by no means say it does not). Then the pupal period when the application is effective wants ascertaining. I have reason to think that (as in the *Ajax* experimented on by Mr. Edwards) the earliest stage is the sensitive one, and this makes it difficult to get in England American pupae in the proper stage. Hoping that some of your readers will take up this very interesting question—which will offer them the compensation for their labours certainly of presenting them with some beautifully coloured and probably not before seen varieties, and thanking you, I beg to remain,

Yours very truly,

F. Merrifield.

CHOICE OF FOOD.—In *Psyche* for October, page 166, is a note with the above title concerning *Platysamia ceanothi*. The habit mentioned does not appear abnormal when the species is observed in its native country, as many, if not most species in California seem to prefer the tender leaves at the ends of the twigs. This is true, not only of Bombycids, but of many butterflies. It is, probably, due to the fact that the leaves of many of the native trees become quite hard when mature, as for example, the live oak upon which the larvae of *Thecla grunus* feed. These larvae are unable to eat the nearly mature leaves, and starve if not furnished with growing tender ones. The principal food plants of *P. ceanothi* as observed by me in Yosemite were *Ceanothus integerrimus* and *Rhamnus californica*. The leaves of the former are very thin and tender, even when old, and the larvae readily ate them; of the latter, they preferred the young leaves at the ends of new shoots.

Harrison G. Dyar.

NADATA GIBBOSA. — *Eggs* laid July 30th. They were small, hemispherical, the flat side attached to the leaf; opaque yellow with a white bloom all over them.

Aug. 5th they hatched, the *young larva* being not quite $\frac{3}{4}$ inch long, clear yellow in color, with short, sparse hairs, and very slender anal props. The head was very large, and the body tapered from it to the anal props.

Aug. 9. *First moult.* $\frac{1}{4}$ inch long, tapering as before. Head large, round, green. Body green with yellow lateral line. Sparse hairs visible only with a lens. Feet and props green.

Aug. 13. *2nd moult.* $\frac{1}{2}$ inch in length. Head very large, round, bilobed, very yellow green. Body tapering to anal props, white-green in color, with a pale yellow lateral line, or band. Sparse hairs. Feet and props green. The colors grew paler.

Aug. 19. *3d moult.* $\frac{3}{4}$ inch in length. Anal shield edged with yellow. Otherwise as before.

Aug. 25. *4th moult.* $1\frac{1}{4}$ inches long. Head large, round, with a deep suture, white-green, lighter on top. Body blue-green, dotted with white, and so thickly dotted on the dorsum as to look almost white. Lateral line yellow in some specimens, almost white in others. Anal shield edged with yellow. Feet and props green. Spiracles white encircled with tan-color. They grew to $1\frac{1}{2}$ inches in length, were stout, and had the general shape of the "cut-worms." Sept. 4th the first one stopped eating, grew a little purplish on the back and sides, and spun a thin web on the bottom of the tin.

Sept. 9th. *Pupa* appeared. It was $\frac{1}{2}$ inch long, stout, shining, very dark brown, a little lighter between the segments. Abdominal segments pitted. Eye-cases very smooth and prominent. Anal hook short, bifurcated.

Caroline G. Soule.

A CORRECTION. — I have referred to the sycamore in my description of *Heterocampa unicolor* and again in that of *Halisidota harrisii* (Psyche, v. 6, p. 164) as *Acer pseudo-platanus*. This is a mistake for *Platanus occidentalis*.

Harrison G. Dyar.

NOTES: — Candèze has just issued at Liège a systematic catalogue of Elateridae known in 1890. The price is six francs.

The last number of the Canadian entomologist is especially valuable from its containing two interesting papers read to the Entomological club of the American association for the advancement of science, in August; viz., Mr. H. G. Hubbard's account of Insect-life in the hot springs of the Yellowstone National Park, and Mr. E. A. Schwarz's Preliminary remarks on the insect-fauna of the Great Salt Lake, Utah.

The 8th part of Moore's *Lepidoptera Indica* contains a table of the genera of Indian Satyrinae, 56 in number, and descriptions of the species of seven of the genera, together with the usual eight plates. It is interesting as figuring a considerable number of dry and wet season broods of Indian Satyrinae distinguished by de Nicéville. The early stages of two species only are given. The notes upon the distribution of the species are interesting and extensive, as usual. We notice one typographical error in the incorrect type used in the heading for *Virapa radzu*.

The September number of the *Entomologische nachrichten* is entirely given up to a new systematic arrangement and synoptic table of the genera of Aeschnidae, by Dr. F. Karsch, in which he criticises the previous system of de Selys.

W. A. Wagner publishes in the Bulletin of the Moscow society of naturalists (1890, 626) a full description of the structure and habits of a new trap-door spider, *Tarentula opiphex*, which is specially interesting as being the

first known instance of a spider making an operculate burrow, outside of the *Territelariae*; the paper is accompanied by an excellent plate.

Mr. E. P. Van Duzee has published in the Bulletin of the Buffalo society of natural sciences an annotated list of the *Macrolepidoptera* of the vicinity of Buffalo, numbering 777 species. The relative abundance and station of most of the species are given.

Two more new works upon British insects are now under way. Mr. Charles G. Barrett, one of the editors of the Entomologist's monthly magazine, is publishing through Reeve and Company a descriptive account of the families, genera, and species of *Lepidoptera* of the British Islands with an account of their preparatory stages, habits, and localities. It is to be issued by parts in a large and small paper form for 54 and 10 shillings respectively. The second work is an account of British flies by F. B. Theobald, which is published by Elliot Stock. Six parts are to appear annually at a shilling each, but the extent of the work is not indicated in the advertisement of the same.

The seventh part of Kolbe's *Introduction* to the knowledge of insects completes in about twenty pages the account of the abdominal appendages by sections on the external male organs of generation, the fleshy legs of many larvæ, and a few minor topics, besides a bibliography of the subject which itself extends over half a dozen pages; this and the other special bibliographies, of which this part has several of much value, would be more convenient if more orderly; they appear to be neither alphabetical nor chronological and to have been somewhat hastily compiled. The internal organs occupy the rest of the part; first the hard parts and then the muscles, though in this the order of the prospectus is slightly violated. All the subjects are treated in the same excellent manner as in the earlier parts, but at the present rate the work will not be finished for several years.

At the October meeting of the Entomological Society of London Mr. Johnson exhibited a specimen of *Nabis* killed while holding its prey, a very hard species of *Ichneumon*; Mr. Saunders thought that from the nature of the *Ichneumon* the only chance the *Nabis* had of reaching its internal juices would be through the anal opening. Mr. Wailly exhibited larvae of *Citheronia regalis* in various stages bred from eggs received from Iowa and thought to be the first bred in England; Prof. J. B. Smith of New Jersey took part in a discussion which followed upon the habits of the larva. Dr. Sharp showed a weevil, *Ectopsis ferrugulis* of New Zealand, the ends of the elytra of which bore a close resemblance to the section of a twig cut with a sharp knife.

PROCEEDINGS OF SOCIETIES.

CAMBRIDGE ENTOMOLOGICAL CLUB.

13 FEBRUARY, 1891.—The 160th meeting of the Club was held at 156 Brattle St. Mr. S. H. Scudder was chosen chairman.

Mr. S. H. Scudder showed two of the specimens of *Zopherus* mentioned by him in *Psyche* (v. 5, p. 406) which were still living. He also exhibited some interesting figures of fossil *Rhynchophora* from Florissant, Col.

13 MARCH, 1891.—The 161st meeting of the Club was held at 156 Brattle St. Mr. S. Henshaw was chosen chairman.

Remarks were made concerning the recent death of Mr. Holmes Hinkley, one of the more active members and a member of the Executive Committee.

An informal discussion followed on the monstrosities of *Coleoptera*, in which all participated. Mr. S. H. Scudder showed one specimen each of *Galerita janus*, *Chlaenius tomentosus*, *Lachnosterna fusca*, and *Trichius piger*, all of which exhibited some curious malformations. (See *Psyche*, v. 6, p. 89-93, pl. 2.)

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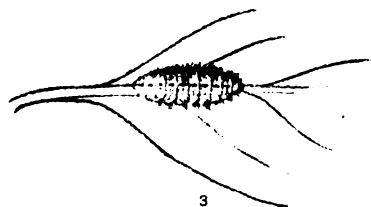
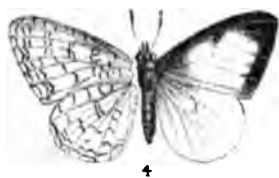
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PSYCHE.

THE LIFE HISTORY OF SPALGIS S-SIGNATA HOLL.

BY W. J. HOLLAND, PH.D., PITTSBURGH, PENN.

In November of last year I published in *Psyche*, vol. 5, p. 426, a description of a new species of *Spalgis* Moore, from Kangwe, upon the Ogové River, West Africa, and gave to it the specific name *s-signata*.

I have recently received the larva and chrysalis of the insect, accompanied by a note from the collector, Rev. A. C. Good, Ph.D., which shows that we are dealing with a species, which is in its habits closely related to our own *Feniseca tarquinius* Fabr. The creature is aphidivorous in its larval state, as Mr. Good shows. We thus have knowledge of four species of *Lycaenidae*, the caterpillars of which are characterized by carnivorous propensities. They are

Feniseca tarquinius Fabr.,

Spalgis epius Westwood,

Liphyra brassolis Westwood,

Spalgis s-signata Holland.

The life history of *Feniseca tarquinius* has been thoroughly worked out by Miss Emily Morton and Mr. W. H. Edwards. The life history of *Spalgis epius*, as given by Mr. E. E. Green, of Pundul-oja, Ceylon, and incorporated

in vol. 2 of the "Butterflies of India, Burmah, and Ceylon," by De Nicéville, finds confirmation in the discovery of Rev. Mr. Good. Mr. Green calls attention in loc. cit. to the fact that there must have been an error made in assigning to *S. epius* the larva and chrysalis which are attributed to that species in Mr. Moore's great work upon the *Lepidoptera* of Ceylon. That the larva of *Liphyra brassolis* is aphidivorous is an inference of the writer, and is based upon grounds, which he has fully detailed in the *Canadian entomologist*, vol. 19, p. 61. Undoubtedly, as we come to a fuller knowledge of the habits of the *Lycaenidae* of the tropics of the old world, we shall find that there are several genera besides those which have been named that have similar habits. I strongly suspect that the larvae of *Lachnocnema* and of *Euliphyra mihi*, are like the larvae of *Spalgis* and *Feniseca* in their food habit.

I give upon Plate 4 the figure of the larva, the chrysalis, and the imago of *Spalgis s-signata*, and have also given a magnified representation of the dorsal

aspect of the chrysalis, which excited very naturally the surprise of Mr. Good, as his note which I append to this brief account shows. It is worthy of remark that the same strange likeness to a human face which is found in *S. s-signata*, is observable in *Feniseca tarquinius*. In the notes sent to Mr. Edwards by Miss Morton, and published in the Canadian entomologist, vol. 18, p. 147, she asks "Have you noticed the ape's face which the chrysalis shows?"

While Mr. Good regrets that he was unable, in inflating the larval skin, to preserve the white matter adhering to it, there is, nevertheless, a good deal of it clinging to it. Examined under a powerful microscope this adhering matter is seen to present a peculiar shining appearance, and to thickly cover the hairs with minute granulations as if each hair had been dipped in some substance like a solution of sugar or salt, and then had been dried. I herewith give Mr. Good's notes:

January 19th, 1891.

"Today I stumbled upon the queerest object which I think I ever saw. On the underside of the leaves of a fragipanni I saw a number of small chrysalids which bore a most absurd resemblance to a human face. I found a few of the larvae still unchanged. Their color was dark brownish, but I have inflated one, and that will be better than any description. The body was all covered over with a whitish substance, not a part of the body, and which I took to be the remains of plant lice with which the underside of the

leaves on which the larvae were found abounded. I think that these caterpillars must have fed upon these white plant lice, for I could not detect that they had eaten the leaves. Almost all of the white foreign substance is rubbed off of the specimen which I inflated, and I regret that I did not succeed better in preserving the specimen just as it appeared. The chrysalis is attached to the leaf by the back of the head,* and presents to view what mimics in a wonderful way the face of a man or a chimpanzee. Especially do the eyes and the well-marked brows overhanging them present a startling resemblance to the human face. The natives notice and are surprised at the resemblance as much as I am. Here is mimicry, but to what possible purpose? Or has Dame Nature for once laid aside her usually practical character and decided to amuse herself? I hope I may be able to preserve and send a chrysalis intact."

January 24th, 1891.

"Today two of No. 10 have emerged, and I am pleased to find that we are dealing with a rare butterfly. The empty shells show nothing of the resemblance to a human or monkey face of which I have spoken previously. I have therefore dried a chrysalis, and have succeeded well, except that one eye looks a little bloodshot. I hope that you can make out the exact appearance of the chrysalis."

* Mr. Good, when speaking of the "head" in this connection, is not employing technically accurate language, but is accommodating his phrase to the appearance of the chrysalis. The mode of attachment is precisely like that to be observed in *Feniseca tarquinius*.

Later.

"Fourteen butterflies emerged from the chrysalids, but some of them did not disclose the imago, but dried up in the box, retaining their natural appearance. I send these in a roll of paper."

EXPLANATION OF PLATE 4.

Fig. 1. *Spalgis s-signata* Holland.
Chrysalis enlarged.

Fig. 2. Same. Chrysalis, nat. size.

Fig. 3. Same. Larva.

Fig. 4. Same. Imago.

LIFE HISTORY OF ORGYIA CANA HY. EDW.

BY HARRISON G. DYAR.

ORGYIA CANA Hy. Edw.

1881.—H. Edwards, *Papilio*, v. 1, p. 62.

Egg. Slightly conoidal though almost spherical, smooth, shiny, opaque white, with a faint brownish spot and ring at the flattened end; diameter 1 mm. The eggs are laid in a mass on the cocoon of the female moth, fastened together by a slight amount of froth and thickly covered with the faintly brownish down from the body of the moth. The winter is passed in this stage, the little larvae hatching in the spring and emerging as mature moths in July and August. There is but one brood a year.

First larval stage. Head shining black, labrum a little paler; width 0.4 mm. Body sordid purplish black, a dorsal yellowish shade on joints 3, 4 and 9 and a whitish stigmatal line. Warts black, the subdorsal ones on joint 2, large; hair thin, but several hairs grow from each wart, black. There are no brush-like tufts, hair pencils nor retractile tubercles, but the places of the latter are indicated by a dorsal red spot on joints 10 and 11 respectively, not elevated.

Second stage. Head brownish black, shiny; width 0.7 mm. Body and warts black, hair thin, bristly and black. The subdorsal warts on joint 2 are large, but there are no brush tufts nor pencils. The retractile tubercles are present on joints 10 and 11, small, and colored dull blood red. The dorsum is paler on joints 3, 4 and 9.

Third stage. Head black with a brownish tinge, labrum white; width 1.1-1.3 mm. Body black except on the dorsum of joints 3 and 4 where it is yellowish white with a black dorsal line, and also a yellowish subdorsal spot on joints 9 and 10 (anteriorly). Warts all black; hair long, black with pencils of short, plumed, black hairs from the subdorsal warts of joint 2 (none on joint 12). There are small, dorsal, black, brush-like tufts on joints 5 and 6 and a few short tufted white hairs on joints 7 and 8. The warts of row 2 on joint 9 are a little tinged with red. Retractable tubercles red. Length of larva about 9 mm.

Fourth stage. Head brownish black, labrum and antennae sordid white; width 1.7-1.8 mm. Body greenish black below, gray on the sides, a black subdorsal and yellow subventral line. Dorsum largely sordid yellow; cervical shield, a dorsal line on joints 3 and 4, a shade surrounding the tufts on joints 5-8, and a broad band from joint 9 posteriorly to joint 12, all black; joint 13 dark gray. The warts of rows 1-5 and the retractile tubercles are all blood red, concolorous, except those on joint 2 which are black. The plumed pencils on joint 2 are 2.5 mm. long, and there is now also one on joint 12 dorsally. The brush-like tufts on joints 5 and 6 are brown, those on 7 and 8 white. The other hair is long and black but whitish subventrally.

Fifth stage. Head shining black with a faint brownish tinge, labrum and antennae pale yellow; width 2.1-2.6 mm. The body is colored as in the previous stage but the black shade surrounding the brush tufts fills in nearly all the dorsal space; hair pencils from joints 2 and 12, 3 mm. long. Spiracles black, a white dot posterior to each. The arrangement of the warts is as follows: row 1 anteriorly next to dorsal line on joints 5-12; 2 subdorsal; 3 suprastigmal; [4 absent, represented by the white dots posterior to the spiracles;] 5 subventral; 6 also subventral, just above the bases of the legs and a little posterior to the other warts; and row 7 consists of four small warts on the venter of the legless segments. On joint 2 warts 2 and 3 are on the cervical shield, small; 4 is large, subdorsal; 5 also large, lateral. On joints 3 and 4 all are present but 1 and moved up somewhat. On joint 13 there are but three warts, the upper two large besides very minute ones on the anal plate. The brush tufts arise from wart 1 and the upper part of 2.

Sixth stage (all ♂ and some ♀ mature larvae). Head brown-black, shiny, clypeus pale centrally, labrum and antennae white; width, 3.1-3.6 mm. Body velvety black, a broken buff subdorsal line on joints 3 and 4, represented by buff or yellow spots on joints 5 and 8-11 a little farther down the sides; a similar smaller subventral row running the whole length. Cervical shield pale, shaded with black, its warts crimson. The warts of rows 1-5 are fine dark crimson, large, the hair long and black. Plumed pencils black, 7.5 mm. long, showing a marked difference from the previous stage. Retractable tubercles crimson, a little brighter than the warts. Brush tufts large, *all unicolorous*, brownish silver gray, darker along the crest, showing another marked difference. Feet reddish, black at their bases. As the stage advances the brush tufts become black centrally, the side hairs remaining white.

Seventh stage (some ♀ larvae only). Head

round, brownish black, shiny, a pinkish white line above the mouth; antennae reddish, ochereous at base; width 4 mm. Body dark gray, black dorsally, a broken subdorsal band nearly covering the dorsum on joints 3 and 4 and a broken substigmatal band. All the warts of rows 1, 2, 3 and 5, retractile tubercles and cervical shield fine crimson, the tubercles a little brighter. The warts of row 4 are present but very small, situated back of the spiracles and colored ochre yellow.

Cocoon. Oval, regular, nearly opaque, composed of hair and silk.

♂ pupa. Robust; wing and antenna-cases prominent; abdomen tapering, cremaster long, terminating in minute hooks; sparsely covered with rather short fine whitish hairs. Color rather light brown; spiracles black. Length 12 mm.; width 5 mm.

♀ pupa. Very large and robust, thorax and cases small, wing-cases of moderate size; abdomen nearly cylindrical, cremaster flattened, ending in many hooks. Smooth very shiny pale brown, with a few sparsely distributed pale hairs; spiracles black. Length 22 mm.; width of abdomen 9 mm., of thorax 4.5 mm.

Food plants. Species of oak (*Quercus kelloggii* and *Q. chrysolepis*) also wild coffee (*Rhamnus californica*) and willow (*Salix*).

Larvae from Yosemite, Cal.

♂ moth. Primaries dark gray, whitish scales thickly scattered on a nearly black ground; an obscure black basal line and a brownish patch outside this, covering the lower half of the wing before the t. a. line, edged above by a black line and narrowly separated from the t. a. line. Transverse anterior line broad, black, gently waved and slightly produced outwardly above m. vein; a reniform discal spot, outlined in black, filled in with a yellowish white shade and narrowly bordered with whitish. Transverse posterior line starting from costa almost above reniform, passing outward and around the spot and continuing to internal margin parallel

to t. a. line. On the costa beyond t. p. line a black patch from which proceeds the whitish subterminal line, almost parallel to the t. p. line and most strongly marked just before its junction with internal margin, almost forming a white crescent. A black terminal line. Fringes blackish, interrupted with paler.

Secondaries blackish with a chestnut tint, especially centrally. Below nearly uniform dark blackish gray with a slight chestnut tint; discal dot and t. p. line indicated in black.

♀ *moth.* Abdomen extremely large, thorax small, legs slender, wings larger than usual, 6 mm. long. Color white with a faint brownish tinge; down dense, especially on the under side of abdomen; dorsum broadly dark cinereous, both on thorax and abdomen; wings faintly brownish; eyes black. Antennae shortly pectinated. Length 18 mm.; width of abdomen 12 mm.

Habitat probably the Sierra Nevada of California. Recorded from Havilah, Kern Co., (Hy. Edw.) and Yosemite, Mariposa Co.

A LIST OF SOME OF THE CATALOGUES AND LOCAL LISTS OF NORTH AMERICAN COLEOPTERA.—III (R.-Z.).

BY JOHN HAMILTON AND SAMUEL HENSHAW.

105 **Rauterberg**, Fr. Coleoptera of Wisconsin. (Proc. nat. hist. soc. Wis., 1885, p. 10-25.)

A list of 269 species and varieties of Cicindelidae and Carabidae with notes on the locality and time of occurrence.

106 **Reed**, E. B. Coleoptera taken in the neighborhood of London, Ont. (Can. ent., 1869, v. 1, p. 69-70.)

Number of families (31) genera (129) and species (180) found in the vicinity of London, Ont.; over 130 undetermined species additional to the above have been collected.

107 **Reinecke**, Ottomar. Additional list of Coleoptera. (Bull. Buff. soc. nat. sci., 1882, v. 4, p. 55.)

44 species are listed from the vicinity of Buffalo, N. Y.

Reinecke, Ottomar. See: ZESCH, Frank H.

108 **Ritchie**, A. S. On the Coleoptera of the Island of Montreal. (Can. nat. and geol., 1869, ser. 2, v. 4, p. 27-36.) Separate: 11 p.

215 species are listed from the Island of Montreal and 31 Canadian species taken outside the Island of Montreal.

109 **Sahlberg**, John. Coleoptera och medlemmar ä Berings Sunds Amerikanska Hemiptera insamlade af Vega-expeditionens kust. (Vega-exped. vetens. iakt., 1885, bd. 4, p. 59-71.)

16 species of Coleoptera are listed from Port Clarence, Grantley Harbor and Bay of Iman-Ituk.

110 **Saunders**, W. Entomological notes during a trip to Saguenay. (Can. ent., 1868, v. 1, p. 11-13.)

18 species are listed with localities.

Savage, H. See: HAYWARD, R.

111 **Say**, Thomas. Descriptions of coleopterous insects collected in the late expedition to the Rocky Mountains, performed by order of Mr. Calhoun, Secretary of War, under the command of Major Long. (Journ. acad. nat. sci. Phil., 1823, v. 3, p. 139-216; 1824, p. 238-282; 298-331; 403-462; 1824, v. 4, p. 83-99.) Ed. Leconte, v. 2, p. 89-236.

Describes 354 species.

112 **Schaupp**, F. G. The Cicindelidae of the neighborhood of New York. (Bull. Brooklyn ent. soc., 1878, v. 1, p. 28.)

A list of 15 species with localities and times of appearance.

113 **Schaupp**, F. G. [Florida Coleoptera.] (Bull. Brooklyn ent. soc., 1878, v. 1, p. 34.)

Adds 13 species to those listed by Schwarz.

114 **Schaupp**, F. G. List of Carabidae found in the neighborhood of New York city. (Bull. Brooklyn ent. soc., 1883, v. 6, p. 29-32; 71-72.)

212 species are listed with localities and times of appearance.

115 **Schmelter**, H. Coleoptera of the neighborhood of New York. Chrysomelidae. (Bull. Brooklyn ent. soc., 1878, v. 1, p. 55.)

96 species are listed.

116 **Schwarz**, E. A. List of Coleoptera collected in Michigan in 1874. (Psyche, 1876, v. 1, p. 145-148.)

102 species are enumerated with notes and localities.

117 **Schwarz**, E. A. The Coleoptera of Florida. (Proc. Amer. philos. soc. 1878, v. 17, p. 353-471.)

1386 species and varieties are listed on p. 434-469; the occurrence of more than 200 additional species is noted; many new species are described by the author and by Leconte.

118 **Schwarz**, E. A. On a collection of Coleoptera from St. Augustine, Florida. (Proc. ent. soc. Washington, 1889, v. 1, p. 169-171.) Separate: 2 p.

General remarks on a collection of 600 species of Coleoptera collected in the vicinity of St. Augustine, Fla.; 2400 species known to occur in Florida.

Schwarz, E. A. See: HUBBARD, H. G.

119 **Smith**, John B. List of Coleoptera collected by J. R. Spencer at Fort Churchill. (Rep. progr. Can. geol. surv., 1882-83-84, 1885, p. 62 DD.)

14 determined and 2 undetermined species are listed.

120 **Smith**, J. B. Catalogue of insects found in New Jersey. (Final rep. state geologist, 1890, v. 2, 486 p.)

2167 species and varieties of Coleoptera are listed on p. 69-271; localities and collectors are given when known.

121 **Snow**, F. H. List of Coleoptera collected in Colorado in June, July and August, 1876, by the Kansas University scientific expedition. (Trans. Kans. acad. sci., 1877, v. 5, p. 15-20.)

304 species and 12 varieties are enumerated; chiefly identified by Dr. J. L. Leconte. This list also appeared in the Kansas collegiate 1877, v. 2.

122 **Snow**, F. H. The insects of Wallace county, Kansas. (Trans. Kans. acad. sci., 1878, v. 6, p. 61-70.)

Includes captures in Gove county; 316 species and varieties of Coleoptera are listed on p. 62-70 with county localities of capture.

123 **Snow**, F. H. List of Coleoptera collected near Dome Rock, Platte Canon, Colorado, by the Kansas University scientific expedition for 1878. (Trans. Kans. acad. sci., 1878, v. 6, p. 75-77.)

99 species and varieties are listed; a few are not fully identified.

124 **Snow**, F. H. List of Coleoptera collected in Santa Fé Canon, N. M., by the Kansas University scientific expedition for 1880. (Trans. Kans. acad. sci., 1881, v. 7, p. 70-77.)

237 species are listed.

125 **Snow**, F. H. Douglas county additions to the list of Kansas Coleoptera in 1879 and 1880. (Trans. Kans. acad. sci., 1881, v. 7, p. 78-79.)

144 species are listed.

126 **Snow**, F. H. Lists of Lepidoptera and Coleoptera, collected in New Mexico by the Kansas University scientific expedition of 1881 and 1882. (Trans. Kans. acad. sci., 1883, v. 8, p. 35-45.)

525 species and varieties of Coleoptera are listed on p. 39-45; some are not fully determined.

127 **Snow**, F. H. Additions to the list of Kansas Coleoptera in 1881 and 1882. (Trans. Kans. acad. sci., 1883, v. 8, p. 58.)

49 species are listed; a few are not fully determined.

128 **Snow**, F. H. Lists of Lepidoptera and Coleoptera collected in New Mexico by the Kansas University scientific expeditions of 1883 and 1884. (Trans. Kans. acad. sci., 1885, v. 9, p. 65-69.)

149 species and varieties of Coleoptera are listed on p. 66-69; some are not fully identified.

129 **Sprague**, P. S. Insect fauna of Camel's Hump, Vt. (Arch. sci., 1871.)

55 species of Coleoptera are listed.

130 **Strecker**, Herman. Coleoptera. (Annual rep. chief engineers for 1878, 1878, p. 1864-1866.)

A list of 33 species collected in the San Juan region of Colorado.

131 **Summers**, S. V. List of Coleoptera of St. Louis county, Missouri. (Can. ent., 1873, v. 5, p. 132-134; 145-147; 168-170; 190-192; 1874, v. 6, p. 52-55.)

598 species and varieties are listed; the list was not completed beyond the Colydiidae.

132 **Summers**, S. V. Catalogue of the Coleoptera from the region of Lake Pontchartrain, La. (Bull. Buffalo soc. nat. sci., 1874, v. 2, p. 78-99.) Separate: 21 p.

906 species and varieties are listed; a few are not fully identified.

133 **Taylor**, George W. The entomology of Vancouver Island. Notes on seventy-six species of Cicindelidae and Carabidae collected near Victoria, Vancouver Island. (Can. ent., 1886, v. 18, p. 34-37.)

Notes of capture and frequency are given.

134 **Townsend**, C. H. T. A list of Coleoptera collected in Louisiana, on or south of parallel 30°. (Can. ent., 1885, v. 17, p. 66-73.)

113 species and varieties are listed, with localities and notes of capture.

135 **Townsend**, Tyler. Contribution to a list of the Coleoptera of the lower peninsula of Michigan. (Psyche, 1889, v. 5, p. 231-235.)

165 species and varieties are listed; a few are not fully identified.

136 **Uhler**, P. R. Report upon the insects collected by P. R. Uhler during the explorations of 1875, including monographs of the families Cydnidae and Saldæ, and the Hemiptera collected by A. S. Packard, Jr., M.D. (Bull. U. S. geol. and geog. surv., 1877, v. 3, p. 355-475; 765-801.)

95 species of Coleoptera from the plains and mountains of eastern Colorado are listed on p. 770-779.

137 **Uhler**, P. R. List of animals observed at Fort Wool, Va. (Studies biol. lab. Johns Hopkins Univ., 1879, v. 1, no. 3, p. 17-34.)

7 species of Coleoptera are recorded on p. 29-30.

138 **Ulke**, Henry. List of species of Coleoptera, collected by Lieut. W. L. Carpenter, United States army, for the United States geological survey of Colorado, 1873. (Rep. U. S. geol. surv., [Hayden's 7th rep.], 1874, p. 567-571.)

104 species are listed.

139 **Ulke**, Henry. Report upon the collections of Coleoptera made in portions of Nevada, Utah, California, Colorado, New Mexico, and Arizona, during the years 1871, 1872, 1873 and 1874. (Rep. geogr. and geol.

expl. and surv. west 100th mer., 1875, v. 5, Zoology, p. 809-827.)

382 species are listed with locality, date of capture, collector and range of habitat.

140 **Walker**, Francis. List of Coleoptera. Lord's Naturalist in Vancouver Island and British Columbia. London, 1866, v. 2, p. 309-311.

94 species are listed.

White, J. E. See: **BRODIE**, W.

141 **Wickham**, H. F. A list of the Coleoptera of Iowa City and vicinity. (Bull. lab. nat. hist. state Univ. Iowa, 1888, v. 1, no. 1, p. 81-92.)

861 species and 10 varieties are listed; a few species are not fully identified.

Wickham, H. F. See: **OSBORN**, Herbert.

142 **Zesch**, Frank H. and **Reinecke**, Ottonmar. List of the Coleoptera observed and collected in the vicinity of Buffalo. (Bull. Buffalo soc. nat. sci., 1881, v. 4, p. 2-15.)

Separate: 14 p.

1424 species are listed.

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MISCELLANEOUS NOTES.—A portion of volume 1 of *Psyche* which has long been out of print is now being reprinted and the volume can shortly be furnished for five dollars. Complete sets of *Psyche* or any one or more of the volumes can therefore be obtained at five dollars per volume. The number of copies on hand, however, is extremely limited and persons desiring to secure full sets or complete their series are advised to make early application to the treasurer, Samuel Henshaw, Cambridge, Mass.

A list of Labrador insects will be found in Dr. A. S. Packard's recent book *The Labrador Coast* (N. Y., Hodges) on pp. 385-396 and 446-447. He catalogues 233 species divided as follows: Arachnida 11, Myriopoda 1, Orthoptera 1, Odonata 2, Hemiptera 4, Platyptera 1, Plectoptera 3, Trichoptera 2, Coleoptera 63, Diptera 11, Lepidoptera 108, and Hymenoptera 26. Notes of distribution and a few dates are added.

Entomologists should not overlook a holiday book of unusual interest for them, noting the out-door and in-door observations of a rambler who knows how to use both eyes and pencil, not to say pen. It is a volume by the artist William Hamilton Gibson, called "*Sharp eyes, a rambler's calendar of fifty-two weeks among insects, birds, and flowers*" (Harper's, \$5.00). Both text and illustrations, the latter on nearly every page, are by the same hand; better, more living

pictures of our insects have never been given, especially where they are represented in flight, when they rival the pictures by Giacomelli; and yet all are "process cuts." The volume is excellent reading as well, and tells the stories of the lives of our common insects in a charming way. It is an admirable book to stimulate the young observer.

In a superb monograph of the trees which furnished the Baltic amber, with eighteen finely colored quarto plates, Conwentz of Danzig publishes some notices of amber insects, especially of such as were injurious to the species of *Pinus* which yielded amber; among other things he figures the borings of a beetle referred by Kolbe to *Anthaxia* and the larval burrows in the dead wood which Brischke looks upon as the work of a *Sciara*.

Dr. Juan Gundlach has just finished the printing of the second volume of his *Entomologia Cubana* which contains the Hymenoptera, Neuroptera, and Orthoptera.

Prof. John B. Smith's promised List of *Lepidoptera of Boreal America* has been issued by the American entomological society; it extends to 124 pages and includes 6020 nominal species, of which 640 are butterflies, 229 Sphingidae and Sesiidae, 590 the families allied to Lithosiidae and Bombycidae, 1861 Noctuidae, 651 Geometrinae, 634 Pyralidinae, 429 Tortricinae, and 986 Tineinae. It follows the style of Grote's Check list of American moths.

PROCEEDINGS OF SOCIETIES.

CAMBRIDGE ENTOMOLOGICAL CLUB.

10 April 1891. — The 162d meeting of the club was held at 156 Brattle Street. Mr. J. H. Emerton was elected chairman.

Mr. S. H. Scudder exhibited a series of over thirty specimens of the acridian *Bryodemella tuberculata* collected many years ago by Parschine in the Trans-Baikal and Amur regions of eastern Siberia, namely at Irkutsk, Verschine-Udinsk, the desert of Khorinskaya in southern Siberia, Khabarowka, and Sarapol. They showed an extraordinary amount of variation in the intensity and extent of the band crossing the hind wings as well as in the depth of the basal tint, some being almost or quite vitreous, while others at the other extreme were a deep rose; the apex of the wing in some was entirely infumated so as to connect completely with the transverse band, while others showed a broad vitreous space outside the transverse band, darkened by the veins only; similarly a great variation was seen in the depth and extent of the mottling of the tegmina and no little difference in the surface sculpture of the dorsum of the pronotum and the vertex of the head. In all, the anterior sulcus of the prozona was far less deeply impressed than in European specimens of the same species. Mr. Scudder also showed specimens of the allied *B. barabensis* collected by Parschine at Verkhni-Udinsk, Verschine-Udinsk, Strelinsk, and the desert of Khorinskaya.

Mr. J. H. Emerton remarked on the New England species of Attidae. He stated that thirty-three species of this family are represented in his collection, of which eight are undescribed. Of these, eight belong to Phidippus and Dendryphantes, seven to the short bodied genera allied to *Attus pulex* and *A. palustris* of Hentz, and three to the ant-like genera. The classification of the remaining species is still undecided. Four species are represented by only one, and three others by only two or three specimens each. Mr. Emerton showed a number of

drawings illustrating the variations in this family.

Mr. R. Hayward recorded the capture in Arizona by Mr. H. K. Burrison of *Aphodius pumilus*, a species described by Dr. Horn in his recent Revision of Aphodius from New Mexico, but which has also been taken by Mr. Bowditch and Mr. Hayward in northern New Mexico.

8 MAY, 1891. — The 163d meeting of the Club was held at 156 Brattle Street. Mr. J. H. Emerton was chosen chairman. After the additions to the library had been announced the Club proceeded to the election of officers for 1891 which had been postponed. The following were elected: President, Prof. F. H. Snow, of Lawrence, Ks.; Secretary, Roland Hayward; Treasurer, Samuel Henshaw; Librarian, Samuel H. Scudder; members at large of Executive Committee, J. H. Emerton and T. W. Higginson.

Rev. W. J. Holland and Mr. A. P. Morse were elected to active membership. Mr. S. H. Scudder communicated some notes on *Oeneis* (see Psyche, v. 6, p. 99-100). Mr. J. H. Emerton remarked briefly on certain crabspiders (Thomisidae) comparing them with the Attidae, an allied family.

12 JUNE, 1891. — The 164th meeting was held at 156 Brattle Street. Mr. J. H. Emerton in the chair. Mr. S. Henshaw was chosen Secretary *pro tem*. Mr. F. C. Bowditch was elected a member.

Mr. J. H. Emerton showed some plates of New England Attidae, and remarked upon the character and distribution of a number of the species; 16 or 17 genera and about 33 species are known from New England.

Mr. S. H. Scudder showed drawings by Mrs. Peart of the terminal segments of the young larvae of *Oeneis brucei*, *Oe. jutta*, and *Oe. macounii*, and said that his proposed division of the genus, as given at the last meeting, into two groups for which the subgeneric names of *Oeneis* and *Chionobas* were suggested, appeared to be well founded. Mr. Scudder also showed the early stages of several European butterflies.

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CAMBRIDGE ENTOMOLOGICAL CLUB.

The regular meetings of the Club are now held at 7-45 P.M. on the second Friday of each month, at No. 156 Brattle St. Entomologists temporarily in Boston or Cambridge or passing through either city on that day are invited to be present.

A very few complete sets of the first five volume of PSYCHE remain to be sold for \$25.

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Scudder, S. H. Historical sketch of the generic names proposed for Butterflies. Salem, 1875.	1.00
Scudder, S. H. The pine-moth of Nantucket, <i>Retinia frustrana</i> . col. pl. Boston, 1883.	.25
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Stettiner entomologische Zeitung. Jahrg. 42-46. Stettin, 1881-1885.	5.00
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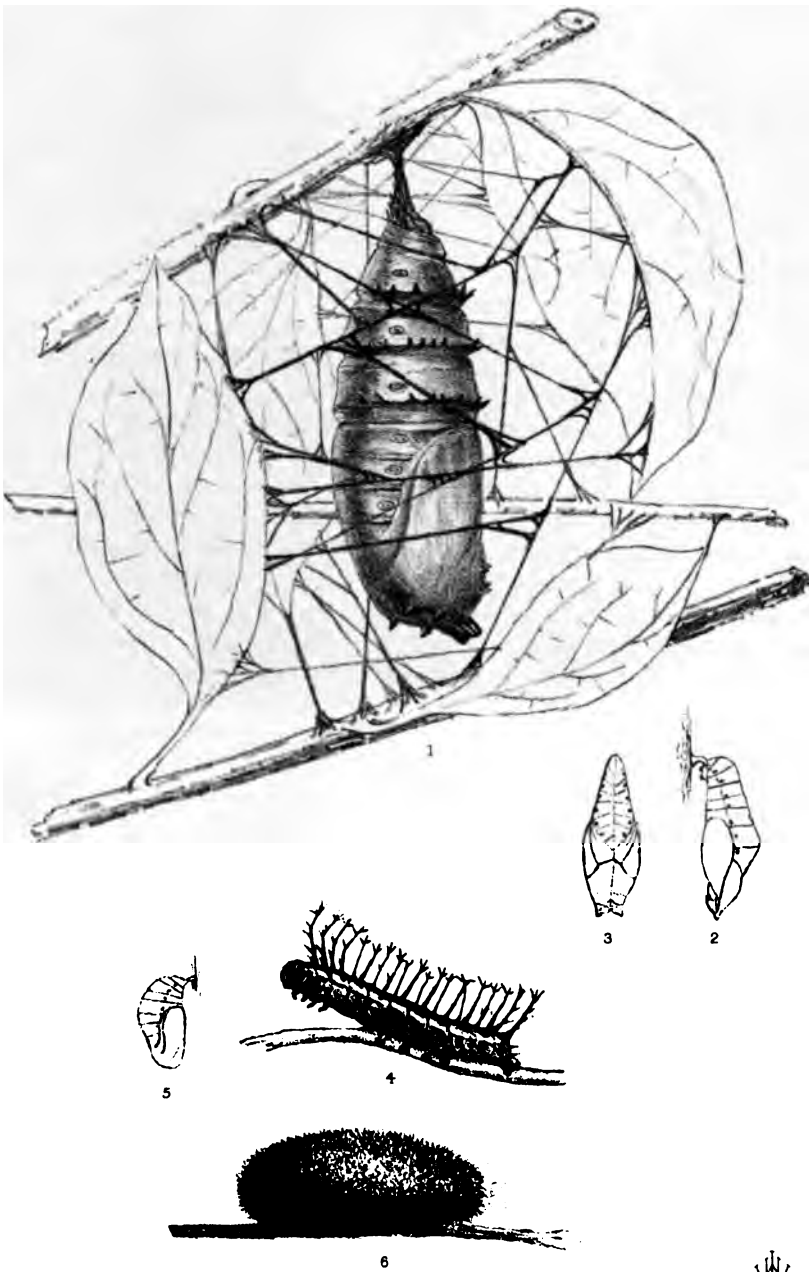
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PSYCHE.

NOTES UPON THE TRANSFORMATIONS OF SOME AFRICAN LEPIDOPTERA.

BY W. J. HOLLAND, PH.D., PITTSBURGH, PENN.

From among the mass of material illustrating the life-history of various species of West-African lepidoptera in my possession, and for which I am largely indebted to my indefatigable coadjutor, Mr. Good, I have culled a few notes, which are likely to prove interesting to the student of entomology. I have in all cases sought to elucidate by presenting sketches of the objects themselves, which I have drawn at moments of leisure, and which may be relied upon to do even more than the verbal accounts which I herewith give to make the subject plain.

SATURNIA ARNOBIA Westw.

In the Proceedings of the Zoological society of London for the year 1881, p. 142, Prof. Westwood described a large bombycid moth to which he gave the name *Saturnia arnobia*. The specimen upon which he based his description came from Old Calabar, and is in the collection of T. Chapman, Esqr., Glasgow.

From Mr. Good I have received several males which correspond in the

main with the figure and description of Prof. Westwood, who does not, by the by, indicate the sex of his type. The females differ quite materially from the males, and there is evidently a dry season brood, which differs in both sexes quite considerably from the wet season form. But the most remarkable fact in the life history of this great moth, which equals in expanse of wing the largest Bombycidae of North America, is the fact that the chrysalis is suspended, and while the caterpillar weaves a few stout silken threads about the spot where it undergoes its transformations, the chrysalis hangs pendulous from its support like the chrysalis of the Nymphalidae. This is best understood from the figure given upon Plate 5.

Before giving a description of the various forms of the species, I give the notes sent me by the collector:—

“No. 43. This number designates a very large moth which emerged from a very large chrysalis. The first of these large chrysalids was handed to me at Elovi, a town fifteen miles down the river from Kangwe. This chrysalis has not yet disclosed the imago, (May 14th,

1888). Two weeks or more afterwards (April 30), I obtained six more chrysalids at the same place, and one of the flies which had come out in the hands of the natives and is not perfect. One of the lot secured upon April 30th came out during the night of May 12th and damaged itself slightly before I discovered it. I send it in the envelope marked 43, and the empty pupa-case in a box marked with the same number. Is not this an anomaly? I have never before obtained a moth from a chrysalis hanging suspended as this one was. When I got the chrysalis first I thought now I have the chrysalis of *Papilio antimachus* or *zalmoxis*, and I'll get the female sure. I had been led to suppose from my reading that chrysalids so suspended and comparatively unprotected always produce diurnal butterflies. The chrysalis is dark green in color, beginning to change before disclosing the moth to a pale green, and later to the yellow of the empty shell."

Mr. Good sent me of this brood six perfect specimens, male and female, and several chrysalids which had failed to disclose the imago, and from one of which the figure on Plate 5 is drawn. Later he sent me three of the second brood, and a chrysalid, which in form is identical with the chrysalids of the first brood, but smaller. This last sending was accompanied by the following note:—

"No. 43.—I designate these specimens by the same mark, No. 43, as those which I sent you in the summer. The chrysalid appears to be identical in

form and color, but the moths are very different in color. If this is the same species then the larvae bred in the dry season do not produce as fine moths as those that feed in the latter part of the rainy season. These specimens emerged Oct. 15th, 1888, the rainy season, which is late this year, having just commenced."

Rainy season brood. ♂. Not differing materially from the figure and description of Prof. Westwood. The ground color is a bright yellow, with the darker markings ochraceous rufous. Expanse 6 1-2 inches.

♀. Wings very broad, and not nearly as pointed at apex as in the male. General color tawny ochraceous, with darker markings deep burnt sienna. Expanse of wings 7—7 1-4 inches.

Dry season brood. The general color of the two sexes is the same, and may be described as Mars brown, with the darker markings of a livid purplish cast. Expanse of wings: ♂, 4 3-4 inches; ♀ 5—5 1-2 inches.

IDIOMORPHUS VALA Ploetz.

Under this name Dr. Ploetz described from a single female a species of *Idiomorphus* (genus of *Satyridae*), which had been collected by Dr. Buchholz upon the West African coast. The species is very common upon the Ogové River, at all events I have received from Mr. Good many scores of examples, male and female. The larval stages of this genus, which is peculiar to the hottest parts of tropical Africa, have

never been described, as far as I am aware. Unfortunately the inflated caterpillar of the species did not turn up in the sending in which it was included. Whether it was destroyed by the carelessness of custom-house officials, or in some other way was lost, I do not know. The chrysalids sent me by Mr. Good came safely to hand and are outlined upon Plate 5. In speaking of the habits of the larva the collector says:—

"The larvae are very peculiar looking creatures, gregarious, feeding sparingly upon a low and very coarse grass, which grows in open ground and forms great bunches. The leaf of this grass is from a foot to a foot and a half in length, and from an inch to an inch and a half in width. When not feeding these caterpillars are always to be seen on the under side of the leaf, lying together as closely as possible, and presenting a very queer appearance. They increase in size very slowly. The chrysalids I send you were suspended from the lid of the box, but in nature they hang from the underside of a leaf or blade of grass. The first of the butterflies emerged Dec. 24th, and the last Dec. 29th. The time during which they remain in the pupal state is about a week."

There are five species of *Idiomorphus* which are found at Kangwe, of which the species before us seems to be the most common. They are the following:—

I. vala Ploetz.

I. hewitsonii Doumet.

I. italus Hewitson.

I. zinebi Butler.

I. sebetus Hewitson.

Of the latter species I have thus far received but a single specimen. It appears to be the rarest of the five.

HARMA CAENIS Drury.

Of this species Mr. Good sends me an inflated larva, and several chrysalids, from which the figures on Plate 5 are taken.

The female of this species is polymorphic. There is a female which very closely resembles the male, and in fact cannot be separated from it, except by an examination of the sexual organs. This form is not common. I have but one specimen. Then there is a dark female, which is the common form and is figured accurately in Staudinger's work upon the Exotic Butterflies, and was also figured by Cramer as *Harma amphiceda*. Then there is still another form in which the basal area of both wings upon the upper side is more or less suffused with red. Both of these latter forms are before me bred in numerous examples from the same batch of larvae.

In a letter received from Mr. Good several years ago he stated that this species is in the habit of migrating in great swarms. Apropos of his account of the migration of *Harma caenis* the following note giving some details as to the migration of another species may not be inappropriately reproduced here.

"Oct. 14th, 1890. To-day at Batanga I saw *Crenis amulia* flying in great

swarms just as some years ago I saw *Harma caenis* in the Ogové region. They seemed to come from nowhere in particular, they flew in no order, no two even keeping company. Sometimes only a dozen were visible, at other times hundreds seemed to fill the air. They flew a little E. of N. E. This has no particular significance, however, as this is the general direction of the coast here. Even upon the beach the migratory movement was easily observed, and as far as I went back, (about half a mile) the air seemed full of the flies. None were returning, and all flew as if they had a definite purpose in view. A native remarked it, and ventured, in calling my attention to the movement to add 'Sometimes they fly so, and sometimes they fly in the opposite direction.' . . .

"I am utterly at a loss to account for the phenomenon. The explanation which I suggested for the migration of *Harma caenis*, which this exactly resembles, will not apply here. That took place near the end of the dry season and was toward the approaching rains. But here the rains are frequent

now, and if these flies are seeking anything to northward it must be dry weather."

CHRYSOPSYCHE MIRIFICA Butler.

I have received from Mr. Good several specimens of this exceedingly beautiful bombycid, and also a specimen of the cocoon, which is very tough and dark chocolate brown in color and studded all over as are many of the cocoons of the African Bombycidae with minute spines, which are derived from the epidermis of the caterpillar. The figure upon Plate 5 will serve better than a description to give an idea of the form of the cocoon.

EXPLANATION OF PLATE 5.

- Fig. 1. Chrysalis of *Saturnia arnobia* Westw.
- Fig. 2. Chrysalis of *Idiomorphus vala* Ploetz. (lateral view).
- Fig. 3. Chrysalis of *Idiomorphus vala* Ploetz. (dorsal aspect).
- Fig. 4. Larva of *Harma caenis* Drury.
- Fig. 5. Chrysalis of " "
- Fig. 6. Cocoon of *Chrysopsycha mirifica* Butler.

CONCERNING THE "BLOOD-TISSUE" OF THE INSECTA.—I.

BY WILLIAM MORTON WHEELER, WORCESTER, MASS.

Hitherto little attention has been devoted to the study of the blood, fat-body, and allied structures in insects. We have extensive monographs on the eyes and other sense-organs, on the muscu-

lature and nervous system, and even on the alimentary tract and its various subdivisions, but few serious attempts have been made to fill the gaps in our knowledge of the physiologically highly im-

portant tissue, so intimately concerned with the nutrition of the organs. Of these attempts two, however, are worthy of special attention — one by Wielowiejski,¹ who approaches the subject from the anatomical side, and another by Graber,² who contributes some valuable observations of an embryological nature.

Wielowiejski includes under the term blutgewebe (blood-tissue) the following structures:

1. The blood corpuscles;
2. the fat-body proper;
3. the pericardial fat-body;
4. the oenocytes, of which he distinguishes three varieties in some insects.

To this list I would add:

5. The garland-shaped cord of Muscid larvae; and
6. a peculiar organ, which I may call the suboesophageal body, and which I have found in the embryos and young larvae of Blatta and Xiphidium.

Wielowiejski is careful not to maintain a common origin for all the components of his "blutgewebe" but comprises them under a common heading on purely physiological grounds, as he expressly states. They are blood-tissue to the extent "dass sie alle von dem sie umgebenden medium gewisse stoffe aufnehmen, zeitweise aufspeich-

ern resp. verarbeiten und irgend welche umsatzprodukte an dasselbe zuruckgeben und dadurch auf die in den hauptgeweben des organismus vor sich gehenden assimilations und desassimilationsprocesse einen einfluss ausuben."

Graber is less cautious and does not hesitate to conclude that the different tissues constituting Wielowiejski's blutgewebe are genetically related. Stated very briefly these are the conclusions at which he arrives.

1. The oenocytes are derived from the ectoderm;
2. They are metamorphosed into the fat-body;
3. The blood-corpuscles arise from the fat-body (and also from the oenocytes?).

Ergo the fat-body and the blood are ectodermal structures! Certainly a remarkable conclusion and one which an even more intrepid investigator might hesitate to advance in these days when we are so accustomed to derive the blood-corpuscles and connective tissue from the middle germ-layer. While my own conclusions differ radically from Graber's, so far as the origin of the fat-body is concerned, I cheerfully confess that his interesting paper was the means of calling my attention to this much neglected subject.

Even the earlier entomotomists were familiar with certain huge cells associated with the fat-body. By some they were supposed to assist in respiration since they were often found attached to the fine tracheal ramifications. Graber

¹ Ueber das blutgewebe der insecten. Zeitschr. f. wiss. zool., 43. bd. p. 512-536. 1886.

² Ueber die embryonale anlage des blut- und fettgewebes der insecten. Biol. centralbl., 11 bd. nos. 7 u. 8. p. 212-224. 1891.

called them¹ "eingesprengte zellen" and regarded them as unicellular glands. It was Wielowiejski who first fully described them and named them oenocytes from their wine-yellow color. He pointed out that these oenocytes are not infrequently the largest cells in the body, excepting the ova, that they are arranged in metameric clusters in the trachigerous abdominal segments and that they are more or less intimately associated with the blood and fat-body. In some cases they occur in the posterior thoracic region. Most frequently pleural in position they may occasionally extend over the sternal region. The separate cells of the clusters are usually distinctly isolated and independent of one another, but in rare instances they may fuse in pairs or to form smaller clusters. The tough and resistant cytoplasmic wall is round or oval and often drawn out into a few pseudopodia-like outgrowths by means of which the cells are suspended to the tracheal ramifications or to one another. The cytoplasm, which is very abundant, is full of yellowish granules and is sometimes radially striated towards its periphery. The large spherical or oval nucleus contains a densely wound and delicate chromatic filament. An idea of the appearance of these cells may be obtained from Fig. 1, which represents a cluster of oenocytes from a nearly mature Phryganeid larva. This specimen does not show the pseudopodia-like outgrowths.

¹ Ueber den propulsatorischen apparat der insecten. Archiv f. mikr. anat., 9. bd. p. 129-196. 1873.

To Graber is due the credit of first pointing out the identity of the oenocyte-clusters with certain metameric cell-masses mentioned by embryologists. Tichomiroff² and Korotneff³ described segmental masses of cells originating from the ectoderm near the stigmata and just pleural to the nerve-cord. Tichomiroff at first regarded these cells as a kind of fat-body but finally concluded that they represented an organ *sui generis* which he called the "gland-like body." Korotneff regarded the migrant ectoderm-cells in *Gryllotalpa* as mesenchymatous, and if I understand him correctly, as giving rise to the fat-body.

I fully agree with Graber that the embryonic cells described by the two Russian embryologists are identical with the oenocytes of Wielowiejski. Graber is also correct in referring to the same category certain huge cells described by me in *Doryphora*.⁴ They originate from the ectoderm as I have since been able to ascertain.

Graber describes the oenocyte clusters in *Stenobothrus* as delaminated from the ectoderm. In *Hydrophilus* he claims that they originate in connection with a distinct pair of metastigmatic invaginations. It appears to have escaped his notice that these invaginations

² The embryonic development of the silk-worm (*Bombyxmori*). Publ. labor. zool. mus. Moscow., vol. 1. 1882. (Russian.)

³ Die embryologie der *Gryllotalpa*. Zeitschr. f. wiss. zool., 41. bd. 1885.

⁴ The embryology of *Blatta germanica* and *Doryphora decemlineata*. Journ. morph., vol. 3, no. 2. p. 291-374. 1889.

were first seen by Patten in *Acifius*.¹ They are also present, as I have been able to make out, in *Blatta*, *Xiphidium* and *Dytiscus*. With the proper methods Graber would also probably have found them in *Stenobothrus*. This second pair of segmental invaginations, which Patten took to represent a second pair of tracheal ingrowths, are supposed by Graber to be the formative centers of the oenocyte clusters. He admits, however, that a delamination of the area surrounding each pit contributes largely to their formation. My own observations lead me to believe that the invaginations are very weak and transient and that they contribute very few, if any elements to the clusters; most of the oenocytes originating by delamination and immigration from a considerable area just caudad to the stigmata. In *Lepidoptera* this area is more extensive than it is in the *Orthoptera*.

In nearly mature *Xiphidium* embryos the oenocyte clusters may be seen shining through the hypodermis much as I have represented them in Fig. 2. They form eight bands running along the pleural wall just back of and alternating with the stigmata.

Now Graber maintains that the fat-body, at least in part, arises from these oenocyte clusters. But a section through a young *Blatta* embryo (Fig. 3) shows most conclusively that this is not the case. At *o* may be seen the oenocytes, still forming a part of the ectoderm *v* from which they have differentiated,

while the fat-body *e* is simply a thickened portion of the inner coelomic wall. The thickening is largely due to an accumulation of fat-vacuoles in the cytoplasm of the mesoderm-cells. Were Graber correct in his assumption we ought either to find no adipose tissue in the embryo outside of the eight trachigerous abdominal segments or be able to show that the oenocytes migrate into the head, thorax and terminal abdominal segments and there form the fat-body — since fat-tissue is developed in all these regions of the body. But although some of the oenocytes do later on migrate into the metathorax and perhaps even into the mesothorax, they never occur in the head. Moreover, long before any migration takes place, thickenings of the coelomic wall, similar to that in the figure, are found giving rise to the fat-body in the thorax, gnathitic segments and also in the terminal segments of the abdomen. Furthermore, the oenocytes, so far as I have been able to observe, are always perfectly distinct from the fat-body, never contain fat-vacuoles, and never divide after they are once differentiated from the ectoderm during embryonic life. Their number is therefore subject to no increase during the growth of the animal. They are, as Tichomiroff claimed, a series of organs *sui generis*. Although they certainly resemble the blood-corpuscles in some insects, they are always much larger and seem not to be amoeboid. They are never seen constricting, or exhibiting any appearance of giving rise to the blood-cells. It follows then

¹ On the origin of Vertebrates from Arachnids. *Quart. Journ. micr. sci.*, vol. 31, pt. iii, new ser. p. 317-378. 1890.

that the fat-body is not derived from the oenocytes, that it is not of ectodermal but of mesodermal origin as claimed by the majority of authors, and that there is no evidence for the origin of the blood from the oenocytes.

It is interesting to note that only the winged orders of Hexapoda, the Pterygota, seem to possess oenocytes. I could find no traces of these peculiar cells in *Lepisma saccharina*, *Campodea fragilis* (young and adult) and *Anurida maritima*, insects which may be taken

to represent the three families of the Apterygota. If oenocytes exist at all in this subdivision of the Hexapoda, they are probably confined to the embryo or to the forms most closely allied to the Orthoptera — like Machilis.

I believe that oenocytes do not occur in the Myriopoda. In the just-born young of *Scolopendra complanata* from the Galapagos I find no traces of them and so far as I am aware they have not been described by any of the investigators of Myriopod anatomy.

DESCRIPTION OF A SARCOPHAGA BRED FROM HELIX.

BY C. H. TYLER TOWNSEND, LAS CRUCES, N. MEX.

I have recently received from Mr. H. A. Surface, of the Ohio experiment station, a small Sarcophagid which he bred from *Helix thyroides* Say, while engaged on his catalogue of shells of Franklin County, published in Bulletin 2, volume 1, technical series, of that station.

Mr. Surface accompanies the specimen with the following note: "The snail was placed in a tight bottle August 25, in Warren County, Ohio, and during the first part of September the pupae were seen. From September 27 to 30 five or six mature flies came forth."

The fly proves to be a small species of Sarcophaga. After considerable time spent in looking over descriptions of North American species, I feel justified in considering it new.

Sarcophaga helici n. sp. ♀.

Eyes brown, bare; front, sides of face and cheeks silvery or cinereous, sometimes with a brassy reflection; frontal vitta dark brown or blackish, about one-third width of front, the front being about one-third width of head; frontal bristles descending a little below base of antennae; the two vertical bristles strongest, directed backward, next three bristles also directed backward, rest more or less forward; two orbital bristles directed forward; a strong anterior pair of ocellar bristles directed forward and outward; sides of face with a few bristles in a row on lower portion next orbital margin; cheeks about one-fourth eye-height, sparsely hairy with a row of bristles on lower border; facial depression more or less silvery, epistoma rather prominent; facial ridges bare except two or three bristly hairs next vibrissae, the latter decussate and inserted on the oral margin; antennae a little shorter than face, black, second joint slightly elongate with a long bristle on front border, third joint

about twice as long as second, moderately wide, rounded at apex; arista blackish, thickened on basal fourth, plumose on basal half, 3-jointed, second joint short; proboscis not so long as height of head, fleshy, dark brown or blackish, with well developed labella; palpi nearly black, moderately long, stout at tip, clothed with a few small bristles longest on the underside; occiput cinereous, clothed with black hairs and fringed with black bristles. Thorax cinereous, with three well defined black vittae reaching scutellum, and with moderately strong macrochaetae; scutellum cinereous, with an apical decussate pair of macrochaetae overreaching base of third abdominal segment, a shorter lateral pair, and a weak sub-discal pair. Abdomen black, more or less heavily shaded with silvery or cinereous, in some places with a golden shade, first segment not shortened; first segment without macrochaetae, second segment with a lateral one; third segment with a median marginal pair and a lateral pair, anal segment with a marginal row of six or eight macrochaetae; anus slightly rufous. Legs blackish, femora more or less cinereous especially front ones; tibiae more or less spiny, especially middle pair; claws and pulvilli short. Wings longer than abdomen, grayish hyaline, with very small costal spine, first vein spined half its length, second spined to small cross-vein; apical cell opening before tip of wing, fourth vein bent at right angle, with wrinkle at bend, apical cross-vein bowed in; hind cross-vein oblique, nearer to bend of fourth vein; tegulae nearly white, halteres blackish.

Length of body 5 mm; of wing 4 mm.

Described from one specimen. Ohio. Sept.

EDWARDS'S N. A. BUTTERFLIES.

We seem among old friends in the twelfth part of Edwards's Butterflies of North America, which appeared early in January; for the early stages figured are of species, *Papilio*

solicaon and *Chionobas uhleri*, very similar to those whose histories have been before illustrated, while the additional figures of butterflies are of other forms of the same genera, *P. americanus* and *C. varuna*. In both the species of which the life-history is told, there are interesting features. In *P. solicaon* the spring butterflies are found to be from wintering chrysalids of all three of the broods of the previous season; it would be instructive to learn in what proportions the first and second broods are represented, and whether any of the chrysalids of the first brood disclose their inmates at the season of the third. In *C. uhleri* breeding and field observations together show the species to be in part double, in part single brooded, and the exact statistics given are very valuable, since the behavior of the species of this genus is very irregular and incongruous, and every new fact helps toward a solution of difficulties elsewhere. It is needless but pleasant to add that the same abundance, one might almost say luxury, of illustration is employed as heretofore, and it is of marvellous delicacy and truthfulness.

Mr. Edwards would render his plates simpler if instead of employing the letters of the alphabet for the different illustrations of the early stages, without uniformity, he would always use some specific and invariable designation, as I, II, or I¹, I², for the different larval stages. Any one can tell at a glance an egg from a caterpillar or a chrysalis, but when the earlier larval stages are magnified, it requires much comparison of letters with legend to ascertain which stage of the caterpillar is presented in particular cases; whereas if figures (1, 2, etc.) either by themselves or in connection with the letter *I* were used, no such reference would be needed, and comparisons could be more readily made. It would also be simpler if in his text he would employ the terms "1st stage," "2d stage," etc., or some equivalent term instead of "young larva," "after 1st moult," etc., neither of which is really definite

though in the latter one would of course supply in the mind the missing "and before ad" needed to make it definite.

DRYOCAMPA RIVERSII Behr. — The name of this species has been omitted from Prof. Smith's new list of lepidoptera of boreal America, but no harm has been done thereby as it must be referred to the synonymy. I have seen three specimens by the kindness of Prof. Rivers and of Dr. Behr. The following is the synonymy and bibliography:

OEDEMASIA SALICIS Hy. Edw.

1876. Hy. Edw., Proc. Cal. acad. sci., v. 7, 121, *Heterocampa*.

1882. Grote, Check list Bomb. No. 238 1-2, *Oedemasia*.

1891. Dyar, Psyche, v. 6, 177.

1891. Smith, List lep. No. 1303, *riversii* Behr.

1889. Behr, Proc. Cal. acad. sci., 2nd ser., v. 2, 94, *Dryocampa*.

Dr. Behr adds walnut (*Juglans*) to the already known food plants of this species.

Harrison G. Dyar.

RECENT LITERATURE.—The eighth part of Buckton's *British Cicadae* has now appeared completing the work, which extends to two octavo volumes with over four hundred pages and eighty-two plates. 239 species are described, referred to 49 genera. The final part contains some matters of general interest, over fifty concluding pages being given up to some special sections: one on the sterilization of Tettigidae is based principally on Giard's papers on "castration parasitaire"; another on the pygofer, with a plate, treats of the male abdominal appendages with special reference to Sharp's observations; a third on fossil Tettigidae, with two plates, is based on the studies of Heer, Westwood, Scudder, and Germar and Berendt; and these are followed by a general summary, with sections on mounting and preserving and on Tettix found on classic coins, illustrated by a plate. An index is given to each volume, but if

there had been added a special table of contents combined with a systematic list of genera, it would have made it more useful and the heads of the separate essays now scattered through the book would have been brought together.

In a recent paper in the *Zoologischer anzeiger* on the chronological succession of wing colors in chrysalids of butterflies, Urech claims that the *Vanessas* must have been originally white! White, yellow, red, brown, black, he finds to be the order in which the colors appear, starting from an originally completely white area. His studies, however, have been too limited to draw such sweeping conclusions, though their interest and perhaps their importance cannot be denied.

Dittrich reports in the *Zeitschrift für entomologie* of Breslau for 1891, p. 21, a cyclopean honey-bee sent him by a school-master in St. Petersburg, one of whose pupils brought it to him saying: "the rascal always flew head downwards!" The only part misshapen was the head whose length exceeded its breadth by one-third. Viewed from the front, a single crescentic compound eye was situated at the upper margin of the head, reaching on either side nearly to the mandibles, without trace of any emargination at the middle line of the head, as one would expect, to indicate the fusion of two eyes. The ocelli were absent.

On further inquiry of the school-master, Herr Hans, the latter stated that he once found a number of such examples in young bees which fell to the ground and repeatedly tried to rise without being able to mount more than half a metre; he had found as many as a hundred in a day; all were born of one mother. The same thing began to be repeated the following year in the brood of the same parent, so that he killed the extraordinary mother. He adds "the daughter of this mother has so far given birth to very few such monsters." Here, surely, is a chance for some Weismannian experiments.

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PSYCHE.

EXPERIMENTS FOR THE DESTRUCTION OF CHINCH BUGS BY INFECTION.

BY FRANCIS H. SNOW, LAWRENCE, KANSAS.

[Annual address of the retiring president of the Cambridge Entomological Club, 12 February, 1892.]

I regret my inability to be present at the annual meeting of the Club on the 8th inst.* I, however, forward the following account of my experiments for the destruction of chinch bugs in the field by the artificial introduction of contagious diseases. This may serve as my annual address as president of the Club. One of your former presidents, Prof. S. A. Forbes of Illinois, adopted a similar subject for his annual address.

At the outset, I desire to call your attention to the difference between my own experiments and those of Prof. Forbes. The latter has been working for several years in the line of communicating contagious diseases to chinch bugs by means of artificial cultures of the microscopic plants which produce disease. He has not, however, thus far, been successful in communicating disease to chinch bugs in the fields by means of artificial cultures. In my own experiments, continued now for three years, I have proceeded upon a different basis. Recognizing the failure of previous attempts to destroy chinch

bugs by the application of artificial cultures of disease germs, I conceived a very simple idea of making the chinch bug himself the vehicle for the communication of disease in the field.

Dr. Otto Lugger of the Minnesota Agricultural Experiment Station in the autumn of 1888 distributed in certain fields infested with chinch bugs the dead bodies of bugs that had died in other fields from disease which was naturally present. Dr. Lugger, however, was in doubt as to whether disease was actually communicated in the field by these dead bugs, thinking that perhaps the disease after all might have reached the fields in which he distributed his material by the natural progress of the disease from field to field. So far as I know, Dr. Lugger did not further continue these experiments, and made no investigations in the laboratory with reference to preserving the infection through the winter and experimenting in the following season with infection thus preserved.

In June, 1889, I obtained the first material for my experiments from a farm in Morris County, Kansas. This material consisted of *Empusa*, deter-

*The address reached the Club too late for the meeting of 8 January.

mined as *Empusa aphidis* by Dr. Thaxter, and doubtless identical with the Entomophthora of Prof. Forbes's presidential address.

With this material I was able to test my theory that chinch bugs from the field having been made sick by contact with the dead bodies of bugs killed by disease in the laboratory, if turned loose in the field would communicate the disease to the field bugs. I found that in the laboratory exposure of healthy bugs to bugs dead from disease, was invariably followed by the death of the exposed bugs in from eight to twelve days. A similar operation in the field led to the same result.

I have thus experimented with all three diseases now known as fatal to chinch bugs: — the *Sporotrichum globuliferum* of Spegazzini which I have called the "white fungus" disease: the *Empusa aphidis* of Hoffman which I have called the "gray fungus" disease; and the *Micrococcus insectorum* of Burrill, which is a bacterial disease. The *Sporotrichum globuliferum* (thus determined by Dr. Thaxter) is identical with Botrytis referred to by Prof. Forbes in his address.

I have been able to keep two of these diseases alive through two successive winters in my laboratory, and have been able to supply farmers with infection upon demand in the following season. My experiments have shown that the two fungus diseases, *Sporotrichum* and *Empusa*, are more destructive in damp weather than in dry, while the bacterial disease (*Micrococcus*) is most destruc-

tive in hot, dry weather; thus in 1890, which was a very dry year in Kansas, the crops being seriously injured by drouth in all parts of the State, the fungus diseases had very little effect in the destruction of the chinch bug, while the bacterial disease was exceedingly destructive. During the year 1891, which was a wet year in Kansas up to the end of July, the fungus diseases sent out from my laboratory again resumed their destructive effect in the fields; the bacterial disease becoming most destructive after the close of the wet weather in July.

Considerable prominence having been given to the subject of my experiments during the year 1890, the legislature of Kansas in February, 1891, made a special appropriation of \$3,500 to enable me to continue my investigations upon a larger scale than had previously been possible. By means of this appropriation I have been able to equip a bacteriological laboratory and obtain the apparatus necessary for thorough study of the subject. I have also been able to propagate infection upon a large scale, in order to meet the large demand from the farmers of Kansas and other States for infected chinch bugs.

During the year 1891 infection has been furnished to about 2,000 farmers, chiefly in Kansas, but also including all the western States exposed to the ravages of the chinch bug. I have received 1,390 reports from farmers stating the results of their experiments. Of these field experiments 1,050 have been successful, 187 unsuccessful, and 153

doubtful. Stated in another form 75.6 per cent of the experiments have been successful; 13.4 per cent unsuccessful; and 11 per cent doubtful. These field experiments have been distributed among the various States as follows: Kansas, 1,222, (successful, 953, unsuccessful, 140, doubtful, 129); Illinois, 40, (successful, 17, unsuccessful, 15, doubtful, 8); Texas, 26, (successful, 13, unsuccessful, 6, doubtful, 7); Wisconsin, 29, (successful, 13, unsuccessful, 13, doubtful, 3); Oklahoma Territory, 26, (successful, 20, unsuccessful, 4, doubtful, 2); Missouri, 13, (successful, 11, unsuccessful, 2); Iowa, 15, (successful, 9, unsuccessful, 5, doubtful, 1); Minnesota, 8, (successful, 3, unsuccessful, 2, doubtful, 3); Indian Territory, 2, (successful, 2); Nebraska, 6, (successful, 6); Indiana, 1, (successful); Arkansas, 1, (successful); Mississippi, 1, (successful).

In order to assure myself of the actual condition of the experiments in the field, I have personally visited a large number of fields during the past season while the experiments were being performed, and have kept a field agent constantly in the field during a large part of the time. He has made a thorough examination of eighteen Kansas counties and has assisted me materially in determining the true character of the field experiments, corroborating in a great majority of instances the reports of the farmers as to the working of the infection in their fields.

In this address I cannot enter extensively into the subject of these experi-

ments, but will give a brief statement of the principal points connected with the laboratory work with each of the two fungus diseases.

On May 23d we began our experiments with *Sporotrichum*. We distributed some fungus-covered bugs from the field of Mr. Mattocks in six infection jars. Into the jars had been put soil taken from the yard, and green wheat. Fresh chinch bugs sent by the farmers were put into the jars — enough to thickly cover the bottom. The jars were covered with cheese cloth and set into a glass case containing moist sand. The soil in the infection jars was not watered, so that the bugs were in a humid atmosphere but not in contact with water. We were in this way able to secure the best conditions for the development of the fungus. When the bugs died in the jars new bugs from the field were put in — the date of restocking being also a record of the time when the bugs in the jars had nearly all died. The following is the memorandum for the six jars started May 23d:

May 23, June 4, June 20.

May 23, May 27, June 4, June 15.

May 23, June 4, June 15.

May 23, May 27, June 4, June 15, June 20.

May 23, May 27, June 4, June 15, June 20.

Seven jars were started May 25th. Their record is as follows:

May 25, June 4, June 19.

May 25, June 4, June 15.

May 25, June 4, June 15.

May 25, June 4, June 15.

May 25, June 2, June 11, June 20.

May 25, June 4, June 15.

May 25, June 2, June 11, June 19.

Four jars started May 27 have the following record :

May 27, June 6, June 15.

May 27, June 11, June 15, June 20.

May 27, June 6, June 15.

May 27, June 6, June 15, June 21.

Thirteen jars started June 2nd, each jar being infected with four fungus-covered bugs from the preceding jars, are recorded as follows :

June 2, June 11, June 20.

June 2, June 11, June 19.

June 2, June 11, June 19.

June 2, June 7, June 15.

June 2, June 11, June 15, June 20.

June 2, June 11, June 19.

June 2, June 11, June 19.

June 2, June 11, June 20.

June 2, June 15.

June 2, June 11, June 19.

June 2, June 11, June 19.

June 2, June 11, June 15, June 20.

June 2, June 11, June 15, June 20.

One jar started June 4 ran :

June 4, June 11, June 20.

One jar started June 5 ran :

June 5, June 15, June 20.

Four jars started June 6 are recorded :

June 6, June 15, June 20.

June 6, June 15, June 19.

June 6, June 15.

June 6, June 19.

The bugs put into the jars on the several dates were from all parts of the chinch bug district of the State of Kansas. They were for the most part just received from the mail and were in vig-

orous condition. They were kept supplied with green wheat. While the bugs in the infected jars were dying at intervals of five to ten days, bugs from the same lots in isolated check jars remained alive and vigorous.

By June 20th the demand for infected bugs was so large that the jar method of infection required more attention than we were able to give it. The results of our separate lots were so uniform and the *Sporotrichum* so vigorous and ever-present that the further watching of separate lots seemed useless. Accordingly June 20th a large glass case was arranged with damp sand three inches deep over the bottom. About ten dead bugs covered with *Sporotrichum* were scattered over the sand and large quantities of live bugs from the field were put in, with plenty of green wheat. In nine days the bottom of the case was thickly sprinkled with white fungus-covered bugs and in thirteen days only a few live bugs remained and the case was restocked. The infection continued to work so rapidly in this case that we found no trouble in filling from it twenty-five to one hundred orders daily. Vast numbers of young red chinch bugs were put into the case together with the adults and they too were an easy prey to the disease. Minute points of white made their bodies conspicuous among the larger flecks of white where the adult bugs lay covered with *Sporotrichum*.

On June 28th *Empusa aphidis* was first noticed in the infecting case. Up to this date it had not made its ap-

pearance in our laboratory in 1891. From this time till the middle of August it multiplied its victims in the infecting cases. For a short time it became more conspicuous than *Sporotrichum* and then subsided.

On July 4th we began experimenting with common shallow dry goods boxes for infecting cases. The inside of the boxes was sprinkled and the bottoms thickly covered with green wheat. A few fungus-covered bugs were sprinkled over the wheat and new bugs from the field were put in in large numbers. Within a week the white fungus-covered bugs were thickly spread over the bottoms and in places the white bugs were literally in heaps. Continued experiments showed that damp wooden boxes offered the best conditions for the development of the fungus and the glass cases were no longer used. *Sporotrichum*, like most fungi, thrives best in a moist atmosphere, but an excess of water, such as occurs in a wet soil or along the sides of a glass case where the vapor often becomes condensed, is detrimental to its development. In the wooden boxes the atmosphere was abundantly humid; but water that was sprinkled in from time to time or that became condensed on the sides of the boxes was at once absorbed by the wood.

During July and August *Sporotrichum* continued to spread through successive lots of fresh bugs from the fields. *Empusa* was always present but was not so conspicuous in its ravages as *Sporotrichum*. In the first weeks of Sep-

tember the diseases began to subside and by the middle of October neither *Sporotrichum* nor *Empusa* appeared to be spreading further. Nor is it at all probable that the diseases are lost. The observations on the life history of these fungi which follow show that provision is made for a period of rest.

June 28th the spores of *Sporotrichum* were transferred by means of a sterilized needle from the dead body of a chinch bug to fifteen culture plates. The culture medium was a mixture of beef broth and Irish moss; enough of the mucilaginous decoction of the moss being added to the beef broth to give a solid medium at 80° F. Within forty-eight hours the spores had germinated and branching mycelia could be seen spreading through the medium. Within three days spores were produced in abundance, but only one spot on one of the fifteen plates was found to be a pure culture, *Aspergillus mucor* and bacteria being mixed with all the other growths of *Sporotrichum*. From the one pure spot spores were transferred to three new plates, and the resulting growths were all pure.

The germinating spore puts forth a mycelium which branches as it grows. At intervals mycelial branches shoot upwards and grow over the surface of the culture medium. Conidiophores arise from these; the conidiophore sends off branches and the spores or conidia are abscissed from these branches in clusters. The average diameter of twenty spores thus produced was 2.3 micromillimeters. It is by means of

these minute spores that the fungus is so rapidly disseminated throughout a field infested with chinch bugs. These spores, however, soon lose their vitality (spores one month old would no longer germinate in our laboratory) and the fungus must make provision for its self-preservation during protracted periods of weather unfavorable to the development of conidial spores.

Culture plates in our laboratory, covered with pure cultures of *Sporotrichum* planted July 9, show the mycelial branches within the culture medium to be swollen at intervals to a diameter of 3.9 to 8.8 micromillimeters; the average diameter of the unswollen mycelial branches being about 2.5 micromillimeters. It seems more than probable that the function of these hyphal bodies is to carry the fungus through the cold of winter or the drought of summer. Experiments have been started in our laboratory to test the germinating power of these bodies, but too late to give the results in this paper.

Resting spores are also found on the culture plates having a diameter of 20 micromillimeters, and a thickness of cell wall of 1.8 micromillimeters. Similar spores are found in the crushed bodies of chinch bugs covered with *Sporotrichum*. While it was found that pure cultures of *Sporotrichum* could easily be obtained, repeated attempts to inoculate chinch bugs from these pure cultures were unsuccessful.

As heretofore stated *Empusa aphidis* was first noticed in our infection case June 28. Eight or ten bugs were found

covered with a vigorous growth of this fungus. This disease had probably been sent in from some field where it naturally existed. *Empusa* continued to multiply in the infection cases and by July 12th it rivalled *Sporotrichum* in the number of its victims. Active bugs without external signs of disease in the afternoon would be found hanging to the wheat blades the following morning covered with a vigorous growth of *Empusa*. If the fungus were left undisturbed it would keep on growing at the expense of the tissues of the bug until nothing were left save bits of the chitinous integument.

Attempts were made to obtain pure fruiting cultures of *Empusa*, but without success. At first bugs covered with *Empusa* were placed on the surface of the culture medium in the hope that the spores would be thrown, as is the habit with this fungus, and the growth of these spores would give a pure culture. The spores were thrown in a ring about the bug to a distance of a quarter of an inch, but a rapid growth of bacteria from the bug broke down the culture medium and the *Empusa* spores did not develop.

To keep the bacteria from reaching the medium a cover glass was heated over a Bunsen burner until it became very much convexed. This was then placed on the culture medium, convex side up, and upon this were placed three bugs covered with *Empusa*. A mycelial growth was obtained in this way uncontaminated with bacteria; but no spores were produced. We have

been unable, then, to attempt the inoculation of chinch bugs with pure cultures of *Empusa*. That the fungus has power to rapidly spread from one *bug* to another the experiments in our infection cases have clearly shown.

A chinch bug covered with *Empusa* seems to be studded with minute gray beads. A thin section cut through the body of a bug in this condition shows the body cavity to be crowded with the mycelial growth and protruding through the integument are vast numbers of broad conidiophores each bearing a single conidium.

It is by the sudden rupture of the conidiophore due to turgescence that the conidia are thrown to some distance.

Where the fungus continues its growth to the complete destruction of the chinch bug the whole mycelial mass breaks up into bodies varying from 16×29 micromillimeters to 23.5×27.4 micromillimeters.

In one instance resting spores, apparently, were found. These were round bodies with granular contents and thick walls and varying in diameter from 21 to 25 micromillimeters.

A chinch bug that died of *Empusa* about the middle of July was confined in a moist atmosphere on a sterilized plate October 10 and on Oct. 13 the entire body was thickly covered with a new growth of *Empusa*. It seems then that the entire mass of this fungus may break up into a resting condition and be capable, whenever the atmospheric conditions will permit, of springing in to new growth.

Careful experiments will be made in our laboratory this winter to test the capabilities of germination and duration of vitality of the spores and hyphal bodies of *Sporotrichum* and *Empusa*.

I append the following as samples of the reports received from the farmers.

ALFRED DOIDGE, SOLOMON CITY, DICKINSON CO., KANSAS.

Infection sent May 8. Experiment successful as reported July 27.

"I experimented with the infected chinch bugs you sent me last May. They were the first bugs you sent out, and it was very wet weather. After I infected them I turned them out in a twenty acre field of wheat. The bugs were very numerous at that time, and hatching. The old ones soon began to die and the ground was white with them. Very shortly after there were no old bugs left in the field, but the wheat was red with young ones. It did not seem to take hold upon them. After cutting the wheat they went into five acres of oats. I concluded that it would not pay to harvest the oats. They were black and red from top to bottom. I never saw the like before. About one week from then I went into the oats and to my surprise the ground was white with dead bugs and the others were sluggish. In eight inches square I believe I could have picked up 1000 dead bugs. They were all in bunches. My five acres of oats were saved by using the infection. I do not think I lost two bushels in the whole crop. I find that the infection is a success in all that you claim for it."

Under November date reported as follows:

"The infected bugs saved me fifty bushels of wheat, four hundred bushels of corn, and two hundred bushels of oats."

C. B. MCALLISTER, BELLE PLAINE, SUMNER CO., KANSAS.

Applied for aid June 20. "The bugs are passing from the wheat into the corn by the million."

Infection sent June 22. Experiment successful as reported October 17.

"It was a success in my case. I followed your advice, putting diseased bugs in the corn. On the fifth day I could find no dead bugs. On the sixth day we found some dead ones, and the live ones were very lonely. The tenth day I could shake a handful of dead bugs off one hill of corn. In fifteen days they were all dead in the corn where I placed the infected bugs. I am very thankful we received the diseased bugs, as I believe it saved us 1600 bushels of corn. If I had sent sooner I would have saved 200 bushels of wheat."

W. W. CORMICK, ANTHONY, HARPER CO., KANSAS.

Applied for aid June 21st. "My corn is run over with bugs."

Infection sent June 24th. Experiment successful as reported October 19th.

"I followed directions closely, and on the seventh day I found dead bugs just the color of the first lot you sent me which were of a white furry appearance. The ground in a few days became pretty well covered with dead bugs. I then received a second lot, the dead bodies of which were black. Where I put black infected bugs the ground was covered with black bugs, and where white infected bugs were put I found the dead bugs to be white. I divided with my neighbors and they reported to me that it was a success. One man said that he could scoop up the dead bugs in great quantities after eight or ten days; he is convinced that the infection did the work. I am convinced that the two varieties carry death with them and each marks its victim peculiar to itself, and

in conclusion I will say: should I ever be troubled again, I would lose no time in writing for bugs."

Reported in November:

"The infected bugs saved 900 bushels of corn in my field."

H. H. COLLINS, BELLEVILLE, REPUBLIC CO. KANSAS.

Applied for aid July 9th. "Bugs are leaving the wheat and are going into my cane, millet and corn. Please send infected bugs by return mail."

Infection sent July 11th. Experiment successful as reported December 25th.

"The observations that I made were as follows: 1st,—There were no dead bugs in field when I placed infected bugs in; 2d,—I found the first dead bugs on the fourth day—just a few—and on the seventh day I found that the bugs were all piling up in piles on the ground, and another thing I noticed was a white fungus on the ground where the bugs were dying; 3d,—The bugs did not seem to do any harm to the growing grain after they began to pile up on the ground; 4th,—I found that the disease spread one-fourth of a mile in about ten days. It was late in the season when I received infected bugs. The people up this way think that the infected bug is the greatest discovery of the age."

M. MONSON, KACKLEY, REPUBLIC CO., KAN.

Infection sent June 23. Experiment successful as reported October 23d.

"The diseased bugs were scattered in an eight acre field of wheat three days before the wheat was harvested. After ten days I found dead bugs in piles so that I could heap my hand full from a spot not larger than my hand. At the same time I found dead bugs in a field where no diseased bugs had been placed one-half mile from mine. Bugs were now travelling from wheat to an adjoining

corn field. Six days after the bugs commenced travelling to the corn, the bugs covered three feet of every stalk about ten rods into the field. On the seventh day I noticed there were not so many bugs on the stalks. I then noticed that the bugs got less in numbers every day until the tenth day when I could scarcely find a bug on the stalks. As the bugs were not more than half grown, it seemed to me a strange act that they left the corn entirely without killing it.

I wondered what became of the bugs and I turned over some lumps of dirt and out flowed piles of dead bugs and live ones also. By taking close notice I found that the bugs had not left the field but had crawled down in the dirt to die. Half of the bugs were at that time dead. In a few days there came a heavy rain which baked the ground. I have not seen a bug there since."

In making their reports as to the benefit received from the use of the infection, 495 of the 1050 successful experimenters gave their own estimates of the number of bushels of grain saved by the experiment. The sum of these estimates amounts in cash value to \$89,176.65 or an average of \$180.00 for each farmer. It is fair to presume that this average may be safely applied to the remainder of the 1050 successful experiments. This gives an aggregate saving of \$189,000. This amount saved by the farmers means additional profit for the railroads and the millers, so that \$200,000 is a very conservative estimate of the actual value of the experiments in 1891.

CONCERNING THE "BLOOD-TISSUE OF THE INSECTA.—II.

BY WILLIAM MORTON WHEELER, WORCESTER, MASS.

Among the Pterygota oenocytes are of very general, perhaps universal occurrence. Wielowiejski found them in Rhynchota, Aphaniptera, Coleoptera, Lepidoptera, Hymenoptera and Diptera. They had previously been noticed by Graber in Orthoptera, Coleoptera and Trichoptera. I have found them in a number of orders in which they have not hitherto been observed and here subjoin a brief account of my observations together with a few notes on oenocytes in some of the orders in which they have been studied by others.

ORTHOPTERA. The oenocytes of *Blatta* and *Xiphidium* are very similar and may be regarded as typical for this order. Arising, as above described, by immigration from the ectoderm just caudad to the abdominal stigmata, they remain at their place of origin throughout embryonic life, but later some of the anterior cells wander into the thoracic cavity. In the adult the metameric arrangement seems to be lost and the oenocytes lie irregularly scattered along the pleural and sternal walls. The separate elements never show any ten-

dency to fuse with one another.

The size of the oenocytes in a given species appears to vary directly as the age of the insect. This is shown by the following measurements:

	cytoplasm.	nucleus.
<i>Xiph. ensiferum</i> } embryo-revolution ½ completed.	11μ	7-9μ
<i>Xiph. ensiferum</i> } hatching	26.5 μ	11 μ
<i>Xiph. fasciatum</i> } larva 10 mm. long	33.5 μ	11 μ
<i>Xiph. ensiferum</i> } adult.	37 μ	12-13μ

Not only do these measurements show a gradual increase in both cytoplasm and nucleus, but they also show that the cytoplasm grows relatively somewhat more rapidly than the nucleus.

EPHEMERIDEA. Fig. 4 represents the pleural portion of a section through one of the abdominal segments of a nearly mature *Blasturus* nymph. Nearly the whole of that portion of the pleural hypodermis which is included between the insertions of the tergosternal, or respiratory muscles, is seen to consist of oenocytes. The hypodermal cells proper are reduced to small chromophilous elements filling the interstices between the large clear adenoid cells and covering them with a thin layer externally. That the oenocytes are really still completely imbedded in the hypodermis and do not protrude freely into the body-cavity is apparent from an examination of their inner surfaces, where traces of the inner ends of the hypodermal cells still persist as plates of protoplasm.

When the abdomen is slit sagittally and spread out, the pale oenocytes are seen to line the pleural angles of the segments as an even pavement-like layer. The area covered by these cells is so large that the metameric masses are interrupted only by the constrictions separating the segments. In the first abdominal segment the oenocytes are heaped up into a mass instead of forming a single layer. It may be further noted that the stigmatic trunks of the abdominal tracheae pass into the gills at the posterior edges of their respective segments, so that the oenocyte clusters lie in front of the stigmata. This is the reverse of their position in the embryos of Orthoptera, Coleoptera and Lepidoptera and were it not that the insect under consideration was nearly mature, we might doubt whether the position of the oenocyte clusters with respect to the tracheae was of much morphological significance. On the other hand the oenocytes of *Blasturus* certainly show a very embryonic condition in that they are still imbedded when the insect is practically mature in the hypodermis from which they differentiated.

The separate oenocytes measure 15—23μ in diameter; their nuclei 7μ. They are perfectly distinct on the one hand from the blood corpuscles which measure only 3.5μ and on the other from the fat-body.

In the nearly adult nymph of a very different species (an *Ecdyurus*-like form, probably the same as the one figured in Eaton's monograph Pl. 59) the

oenocytes are very similar to those of the *Blasturus* nymph. They measure 13-14.5 μ —their nuclei 12 μ . In this species also the difference in size between the oenocytes and the blood-corpuscles is very great. There is nothing whatever to indicate that the latter originate from the former.

Very different is the condition of the oenocytes in the mature nymph of *Hexagenia*. Here they may be detected only with considerable difficulty in the pleural fold between the insertions of the respiratory muscles as a few scattered cells, differing only in size and clearness from the hypodermal cells in which they are imbedded.

ODONATA. In the nymph of an *Agri*-*onine* species of this group oenocytes were detected after considerable search. They are present in clusters consisting of a very few small elements (cytoplasm 12-14 μ ; nucleus 4.5 μ) imbedded, as usual, in that portion of the pleural hypodermis which is included between the insertions of the tergo-sternal muscles. They seem not to be completely covered over by the hypodermis but to project into the body cavity. Their greater size and pale color distinguish them from the hypodermal cells.

PLECOPTERA. In a beautiful black and yellow Perlid larva (perhaps an *Acroneura*) the oenocytes are quite as inconspicuous as they are in the *Odonata*. The specimens studied in section were young, measuring only 6 mm, whereas the mature larva of this same species measures fully 25 mm. Each of the metameric clusters consists of from

5-6 cells and these are imbedded in the hypodermis surrounding the occluded stigmata. They measure 18.5 μ ; their oval nuclei 11 μ . In their affinity for stains they differ but slightly from the hypodermal cells.

The imago of a small unidentified Perlid presented very different conditions, oenocyte sbeing present in great numbers and distributed through the abdomen and thorax. They lie in niche-like excavations in the hypodermal wall, either singly or in groups. Sometimes they appear to form syncytia. They vary considerably in size (cytoplasm 14-55 μ ; nucleus 5-30 μ). The nucleus contains a nucleolus—the only case in which I have found nucleoli in the oenocytes. Compared with their homologues in other forms these cells stain very deeply in borax carmine.

CORRODENTIA. The bright yellow oenocytes of *Psocus venosus* (imago) are massed in metameric clusters about the stigmata. The cytoplasm measures about 18.5 μ in diameter; the nucleus 6 μ . They are not imbedded in the hypodermis, though they lie in contact with it.

The fat-body which stains very intensely in Delafield's haematoxylin and is loaded down with minute urate concretions, extends with hardly any interruption through the whole body—from the cavity in front of the brain to the terminal abdominal segments. The pericardial fat-body is well developed and very distinct from the fat-body proper.

In the workers of *Termes flavipes* the oenocytes are much more difficult to detect. They are flattened cells imbedded in the pleural hypodermis near the stigmata. It is their size which mainly distinguishes them from the hypodermal cells; the latter measuring only 8 μ while the former measure 37 μ .

THYSANOPTERA. Oenocytes occur in compact metameric clusters in a species of Phloeothrips very common on the blossoms of *Chrysanthemum leucanthemum* during July and August.

These clusters occur in at least six of the abdominal segments, possibly in eight, but as they diminish in size very rapidly from before backwards, I am not sure that I have found them in the 7th and 8th metameres. The clusters lie in the pleural region well out in the body cavity and each consists of some 8 or 10 cells which from mutual pressure are often very irregular. The cells measure 18.5-26 μ in diameter — their nuclei 3-6 μ . They are perfectly distinct from the fat-body and blood corpuscles.

A NEW GENUS AND SPECIES OF TABANIDAE.

BY J. M. ALDRICH, BROOKINGS, SOUTH DAKOTA.

The general appearance of the fly is that of a particularly fine large silvery Hippoboscid, with brown wings. Nevertheless, an examination shows it to be truly Tabanid in every respect; in fact, I was at some loss for a while to fix upon a set of generic characters which would clearly separate it from all the present genera of Tabanidae. The venation is normal; the antennae resemble Pangonia in shape and number of annulations; the face is that of Chrysops. The upper corner of the eye, making an angle of about 70 degrees, and not *in the least* rounded off at the tip, but rather produced a little in a very fine point, beyond which is an impressed line, running to the occiput, is one of the best characters. The general proportions of the body, also, are different from those of any other members of the family known to me.

Its habits are unknown, but from its appearance the conclusion looks probable that it lives like a Hippoboscid upon some bird or mammal. Still, there are no modifications of structure that give strong support to this theory. Its claws are distinctly larger than those of Tabani of its size, and the large pits at the bases of the hairs on the first and second antennal joints seem to indicate an unusual development of the sense of touch in this region; both of which peculiarities are not without weight.

GONIOPS n. gen.

Spurs present on hind tibiae, absent from front ones. Eyes narrow, terminating above in an acute angle. Ocelli present. Front broad in female, the callosity longitudinal. Proboscis in repose directed forward. Thorax strongly arched, subglobular. Abdomen (from tip of scutellum) not longer than, and head but about half as wide as, the thorax.

G. hippoboscoides, n. sp. ♀. Head almost uniform light yellow, between the ocelli tinged with brown. Eyes black, bare, not approximated to each other. Front broad, wider anteriorly, with yellow pollen on the sides, a longitudinal callosity more whitish, extending from the ocelli to the beginning of the antennal prominence; in dried specimens a variable impressed line on each side of this callosity. Antennae situated on a distinct transverse prominence, yellow, the third joint more reddish; second joint almost annular, third tapering quite symmetrically, composed of eight annuli. Face yellow, strongly protuberant, shining. Proboscis reddish, directed forward, reaching but little beyond the antennae. Palpi slender, long, yellow, with yellow pollen and abundant blackish hairs. Posterior orbits wide, conspicuous, with yellow pollen.

Thorax whitish yellow below, more brownish above, with minute, appressed, silvery yellow pile; on the anterior border just a trace of a slender, median, reddish line; on each side a broad, indistinct reddish stripe, interrupted along the transverse suture. Scutellum short, as wide as the head, yellow.

Abdomen short, broad, covered with appressed shining silvery-yellow pile; seven visible segments, the last narrow, but little protruded, showing a distinct emargination.

Legs uniformly light yellow, the claws black except at base. Spurs of moderate size on middle and hind tibiae.

Wings hyaline, with a deep brown cloud extending across them, including the following parts: the stigma, all of the marginal cell except the proximal end, all of first submarginal, all of the second except tip, all of the first posterior except posterior half of the distal end, the proximal half of the discal, all of second basal, and middle of anal. There is a characteristic small clear spot in the second basal, at the anterior distal angle. The cloud is clearly defined behind, but fades more gradually in front. The branch of the

third longitudinal vein shows a tendency to emit a stump of a vein. In one of my specimens the vein separating the third and fourth posterior cells is obsolete for the greater part of its course.

Length 12 to 13 mm. Width across expanded wings, 28 mm.

Described from two female specimens, received from Mr. Henry G. Klages, Jeannette, Northumberland Co., Penn.

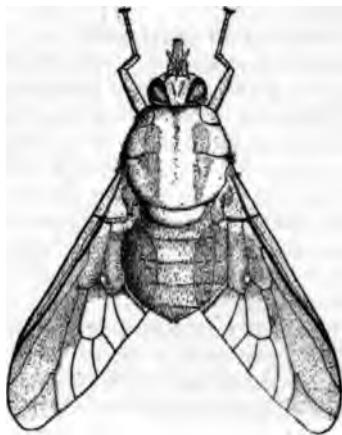


FIG. 1.



FIG. 2.



FIG. 3.

Fig. 1 shows the insect from above, the wings being diagrammatic. Fig. 2 is a side view of the head. Fig. 3 an antenna.

MISCELLANEOUS NOTES.—Klemensiewicz, at the last December meeting of the zoological and botanical society of Vienna, stated that in the preceding summer he had observed hundreds of *Pieris rapae* flying

over an alpine lake in the Tetragebirge, engaged in a new kind of sport, for they occasionally settled down upon the surface and after remaining there a few moments, perhaps half a minute, again took flight, repeating the performance many times; on settling they apparently attempted to rest on the wings of one side only, but the other soon became involved, and after repeated experiments at this play, the moisture-laden wings refused their duty and the butterfly came to grief, as the numerous corpses floating about testified.

The report of the gypsy moth committee to the legislature of Massachusetts, just issued, shows that the insect is now found in about thirty cities and towns, including about two hundred square miles of territory; its limits at last appear to be pretty well defined, but it was found in excessive abundance at places fifteen miles apart; over three quarters of a million of egg-clusters were removed and destroyed during the year; excellent illustrations accompany the report.

Dr. Klebs, of Königsberg, has published a list of the specimens in the amber-museum of Stantien and Becker of that city, covering more than 13000 numbers of which a very large number are insects. He here records for the first time the presence in amber of the coleopterous families Trichopterygidae and Bruchidae; but in a summary list of families, indicating the general arrangement of the museum and where all families known to be represented in amber are marked with a special sign, one half of the twenty-eight families of Coleoptera not so marked have certainly been credited by one author or another as occurring in amber.

PROCEEDINGS OF SOCIETIES.

CAMBRIDGE ENTOMOLOGICAL CLUB.

13 NOVEMBER, 1891. — The 165th meeting of the Club was held at 156 Brattle Street. Mr. Samuel Henshaw was chosen chairman.

A letter was read from the secretary of the

Royal Society of South Australia, of Adelaide, offering to exchange publications. It was voted to accept the offer.

The librarian announced that there was a duplicate copy of "Illustrations of Insects (Heteroptera)", by Townend Glover, and moved that the same be offered for sale by the treasurer, and the proceeds added to the publication fund of Psyche. This motion was carried.

Dr. George H. Horn stated that he had recently been studying the subgenus *Celia* of *Amara*, and remarked at some length on the characters heretofore made use of in the separation of the species. One character which had been proposed for the separation into groups was found in the prosternum, this being punctured in the males of some species and in others not. Dr. Horn, however, regarded this division as likely to confuse the student, as in some species the prosternum may be either punctured or not in the male.

Some discussion followed with regard to the construction of synoptic tables.

Mr. S. H. Scudder read a letter from Mr. Edward Doubleday Harris, reporting the finding of a bright green chrysalis of *Laertias philenor* in New York, one of several raised. Of this color it has never before been reported from the Atlantic slope.

Mr. R. Hayward stated that he had recently been studying the Cicindelidae, and had found in his collection an *Amblychila* which he presumed should be referred to the form *A. piccolomini* of Reiche. The specimen was smaller than the typical *A. cylindriciformis*, smoother, and the carina of the elytra nearest the suture was absent and represented by a row of large punctures. The specimen was from Arizona.

Dr. Horn thought it might belong to a species recently described by Rivers from that locality.

Mr. Hayward showed specimens of the larvae and pupae of *Boletotherus bifurcus* from Underhill, Vt.

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CAMBRIDGE ENTOMOLOGICAL CLUB.

The regular meetings of the Club are now held at 7.45 P.M. on the second Friday of each month, at No. 156 Brattle St. Entomologists temporarily in Boston or Cambridge or passing through either city on that day are invited to be present.

A very few complete sets of the first five volume of PSYCHE remain to be sold for \$25.

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The following books and pamphlets are for sale by the CAMBRIDGE ENTOMOLOGICAL CLUB:

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—Fourth Report, Washington, 1885. . . 2.00

SAMUEL HENSHAW, Treas.,
Cambridge, Mass.

PHALANGIDAE.

I am preparing a monograph of the Phalangidae of North America and will be glad to get specimens from any locality. Will identify and return any sent. Specimens from the Northwest, Southwest, and the Pacific coast especially desired.

CLARENCE M. WEED,

Hanover, N. H.

TACHINIDAE WANTED.

Named or unnamed Tachinidae wanted in exchange, or for study, from any part of North America including Mexico and the West Indies.

C. H. TYLER TOWNSEND,
Las Cruces, New Mexico.

PSYCHE.

AMERICAN PHYTOPTOCECIDII.

BY H. GARMAN, LEXINGTON, KY.

1. On the leaves of *Nyssa multiflora*. A nodular growth of the leaf substance, forming small, rounded prominences on both upper and under surfaces. Above, the cecidii are often lobed and with linear impressions. A three-lobed form with triradiate impression is common. On the under side, the surface of the galls is not impressed, and the shape is more conical, the round or slightly elongated opening being at the apex. They are scattered irregularly over the leaf, and may be very thickly placed. On fully grown leaves cecidii measure from 1 mm. to 2 mm. in diameter, and are about 1 mm. in height on both sides of the leaf, the projection above and below being about equal. On younger leaves cecidii often measure as little as 0.5 mm. in diameter. The walls are thickened, and send into the cavity large processes and ridges which occupy much of the space. There are no hairs inside or out.

This deformation was first collected in Virginia in the spring of 1882. Subsequently it was found in various localities in southern Illinois, and has recently been observed in Kentucky. It sometimes occurs on the same leaves as the next, but thus far has proved most abundant when not so associated.

2. On the leaves of *Nyssa multiflora*. This is a narrow upward and inward fold of the margin of the leaf, and measures from 0.5 mm. to 1 mm. in diameter. In dried specimens the color is dark brown. The leaf where folded is thickened, but is not otherwise greatly changed. The length of folds varies greatly, sometimes being only a few millimeters long, and again including the whole of the leaf margin. The fold ultimately causes the leaf to become scalloped, the scallops measuring from about 2.5 mm. to 3 mm. in length.

This cecidium has been collected in Virginia, Illinois, and Kentucky. Phytognomy from both of the preceding growths have been examined. As far as I know neither form of cecidium has been hitherto described.

3. On the leaves and petioles of *Potentilla canadensis*. This consists of whitish tufts of unicellular hairs, the tufts measuring when isolated and well grown about 0.5 mm. in diameter. The hairs themselves measure about 0.5 mm. in length, and large ones have a diameter at the base of about 0.02 mm. They taper regularly to a point, and under the microscope have the appearance of a tuft of grass blades. The tufts are often so numerous and so closely

placed as to cover much of the leaf surface. They develop on both surfaces but in the specimens examined are rather more common on the upper side.

This was collected at Blue Ridge, Virginia, July 22, 1891, by Professor A. B. Seymour.

4. On the leaves of *Acer spicatum*. Small felt-like patches of a whitish or pale yellow color scattered over the under side of the leaf. Growths on leaves before me measure from 1.5 mm. to 3 mm. in diameter. The growths consist of rather long, tangled and distorted hairs, being quite different from anything else described in this paper. The examples examined are probably all young. Some of the older ones are slightly brown rather than yellow, and probably when aged would have been decidedly brown in color.

Temple, N. H., June 18, 1888, (from Prof. A. B. Seymour).

5. On the leaves of *Acer glabrum*. An Erineum forming large patches chiefly at the tips of the lobes and on the upper side of the leaf. Growing upon the veins as well as elsewhere. On some young leaves before me, thickly sprinkled also over the under surface. This is the handsomest Erineum examined by me. The younger parts of growths are bright purple in color; older parts of growths become of a very dark purple. The deformed hairs are rather large, and are provided with long stalks. The color, manner of growth, and character of the deformed hairs will serve to distinguish this Erineum from the livid growth (No. 8) which appears

on the upper surface of leaves of *A. saccharinum*.

Glenwood Springs, Col., (collected by R. E. Blount; communicated by Prof. A. B. Seymour).

6. On the leaves of *Acer saccharinum*. A slender fusiform gall which projects from the upper surface of the leaf. Walls thin, and smooth inside and out. Length about 4.5 mm.; greatest diameter 1 mm. Opening as usual on the under side of the leaf.

Central Illinois, common; Temple, N. H., (from Prof. A. B. Seymour).

7. On the leaves of *Acer saccharinum*. An Erineum forming patches along veins on the under side of the leaf. The patches are made up of great numbers of minute mushroom-shaped hairs with very short pedicels; sometimes nearly sessile. The hairs and the patches which they form resemble those occurring on the under side of the leaves of *A. dasycarpum*, but the hairs on the latter, as far as examined, were provided with longer stalks, and were not so much inflated at the extremity. The patches in *A. saccharinum*, too, show a tendency to develop along the main ribs, whereas in *A. dasycarpum* they are more scattered, often occurring singly at the tips of lobes. They may notwithstanding these differences prove to be caused by the attacks of one and the same mite. All of the examples which I have seen were rather old and were of a deep brown color, in one case almost black. Individual patches measure as much as 10 mm. in diameter.

Urbana, Ill., common; Lexington, Ky., (received from Prof. W. B. Stark and also collected by myself).

8. On the leaves of *Acer saccharinum*. A fine Erineum forming patches of a livid color between the veins on the upper surface. The growths show a tendency to avoid the veins. They may be isolated in patches 2.5 mm. to 4 mm. in diameter and of very irregular shape, or they may where common combine and then occasionally occupy much of the surface. On badly infested trees scant growths sometimes appear on the under side of the leaves. The color of most of the dried specimens seen is livid. In very young growths but little of this color is apparent, these being mainly pale brown when dried, probably whitish when fresh; but some trace of the livid color can be made out in most young growths. A few of the growths seen were more nearly flesh color than livid.

A variety of this Erineum occurs in which the livid color is almost absent, the dried specimens being of a pale brown color in the largest and oldest growths. Even in this variety, however, close examination with a magnifier shows faint traces of the blue color. In manner of growth the two are alike.

The hairs are capitate, with short stalks, and excepting for their manner of growth and color, are not very different from those forming the brown patches on the under side of leaves.

Fort Mackinac, Mich., (from Prof. Wm. Trelease); Temple, N. H., (from Prof. A. B. Seymour).

9. On the leaves of *Acer dasycarpum*. This cecidium is a pouch-shaped gall which develops on the upper side of the leaves. The mite which inhabits it was many years ago described under the name *Vasates quadripes*, but is a true Phytoptus. The deformations were described by the present writer in the 12th Report of the Illinois State Entomologist (p. 135) as follows: "The form varies to some extent, some of the galls being discoid, or more or less spherical, while occasionally two galls have a common neck and opening. At first the color of the galls is like that of the unfolding leaf, dull purple or green; later they assume the light green color of the veins and veinlets; and still later change in many cases to purplish. Toward the end of summer they dry up and become black. The outer surface is smooth, but the walls are broadly and irregularly impressed making a very uneven outline. On the under side of the leaf the position of the gall is usually indicated by an impression with a tuft of white hairs in the center, which tuft covers the opening into the gall. Occasionally the opening and tuft are borne upon a slight elevation. The height of one of the largest galls seen, measured from the upper surface of the leaf, was 0.1 inch; its diameter was 0.13 inch."

This is one of the most abundant of the mite galls in the Middle states. I have received from both Professors Seymour and Trelease specimens collected at Madison, Wisconsin. It is abundant throughout Illinois and Kentucky.

10. On the leaves of *Acer dasycar-*

pum. An Erineum consisting of large patches of closely matted capitate hairs growing on the under side of the leaf. Patches generally elongated, from a tendency of the growths not to cross veinlets. Well defined, and varying from about 5 mm. to 10 mm. in diameter. When abundant several patches may unite, thus forming more extended ones. Leaves often bear a single patch. Sometimes occurring on leaves bearing also the pouch-shaped galls. Color pale yellowish at first, gradually changing to brown with age, at the last deep brown in color. This is probably the same as No. 26 of Dr. H. Hagen's list (Canadian entomologist, v. 17, p. 24), collected at Shelburne, N. H., by Prof. W. G. Farlow.

Urbana, Ill., not common; Cambridge, Mass. and Ithaca, Wis., (from Prof. Wm. Trelease); Madison, Wis., (from Prof. A. B. Seymour).

11. On the leaves of *Acer rubrum*. An Erineum forming elongated whitish or brown patches on the veins of the upper side of the leaf. This peculiarity of growing on the veins distinguishes this from any growth of the kind I have seen. Several others appear to avoid the veins even when covering most of the surface. The largest growths on leaves before me measure 11 mm. in length by about 4 mm. in diameter. The color varies from whitish in the younger growths through shades of pale yellow to brown. The hairs are mushroom-shaped, as in other similar growths. The only examples seen are from Temple, N. H., and were sent me by Prof. Seymour.

12. On the leaves of *Acer rubrum*. An Erineum growing in large patches scattered on the under side of the leaf. In color, manner of growth and character of the hairs it appears to be the same as No. 9 described as occurring on *Acer dasycarpum*. I have examined a single leaf bearing this deformation received from Prof. Wm. Trelease and collected at Wood's Holl, Mass.

13. On the leaves of *Acer rubrum*. This is a gall which does not differ in any important degree from the galls described as growing on the upper surface of the leaves of *A. dasycarpum*. I assume that it is made by the same Phytoptus, but have had no opportunity to make comparisons. It is moderately common in western Kentucky, and appears to be also common in the New England and other Eastern states. I take it that Dr. Hagen's Numbers 21, 22 and 23 (loc. cit.) are the same growth.

14. On the leaves of *Betula papyrifera*. A profusely growing Erineum forming extensive patches between the large veins diverging from the midrib on the under side of the leaf. The growths sometimes occupy the whole of the space between two veins. The color varies from whitish in the younger growths to pale brown in the older ones. The stalks of the capitate hairs are rather long.

Temple, N. H., (from Prof. A. B. Seymour).

15. On the leaves of *Betula papyrifera*. A small nodular gall which projects from both upper and under sur-

faces of the leaf. Clothed with a fine whitish, silken pubescence. Scattered somewhat irregularly, but with a tendency to be most abundant near the margin. The diameter of large examples is about 1 mm.; the depth is somewhat less in the dried and pressed examples. It is sometimes associated with the Erineum just described. The color of the upper part of the gall is in the dried specimens dull purple. Beneath, the color appears to have been like that of the under side of the leaf.

Temple, N. H., (from Prof. A. B. Seymour).

16. On the leaves of *Betula populi-folia*. This consists of bright, rust-colored growths of deformed hairs in hollows on the under side of the leaf. The corresponding convexity showing on the upper side is devoid of hairs, but is often of a yellowish color. The growths when isolated frequently have a circular outline and are from 2 mm. to 3 mm. in diameter. Large growths become elongated and may measure as much as 10 mm. in length, then occupying much of the space between two of the veins which diverge from the midrib. The number of growths on a single leaf varies in seventeen leaves before me from one to fourteen. In three of the seventeen there are imperfect growths on the upper side of the leaf. The hairs of the growth are capitate.

Temple, N. H., (from Prof. A. B. Seymour).

17. On the leaves of *Betula (lenta?)*. A profusely growing Erineum at first

forming straggling patches and lines on and along the veins on the upper surface of the leaf. Where abundant eventually forming continuous bands upon the veins which diverge from the midrib. The growths very rarely originate away from the veins on the upper surface, but imperfect growths appear sometimes on the under side, here between the veins, suggesting that it is the structure of the surface, which influences the disposition of the growths. The color of very young growths is whitish; on older leaves it is brown, while on several of the largest leaves examined there is an indication of purple on some parts of the bands. Hairs capitate, stalks rather long.

Described from specimens sent me from Temple, N. H., by Prof. A. B. Seymour. From the character of the leaves and the bark accompanying them I judge the species to be *B. lenta*.

18. On the leaves of *Juglans cinerea*. A button-shaped gall on the upper side of the leaf. The galls are green in color, sometimes a trifle lighter in shade than the leaf. They vary from 2 mm. to 3 mm. in diameter, and are about 2 mm. in height; the base is sometimes a trifle constricted. Beneath, the galls are open for almost the entire width, but the opening is occupied by a dense growth of whitish or brownish-contorted hairs. On fifty-one leaves before me the number of galls on a single leaf varies from one to eighteen. Occasional galls occur with the opening on the upper side. The Phytiopti are abundant in examples collected Aug. 15.

Jessamine Co., Ky., frequent.

19. On the leaves of *Fagus ferruginea*. An Erineum which grows on the upper side of the leaf where it follows the veins, forming bands or elongated patches of a brown color. When young, apparently of a whitish color. When abundant, causing the leaf to turn brown so that the position of growths can be recognized by examining the under side. Sometimes forming a close velvety covering on the upper surface. Never, as far as examined, very dark in color. Sometimes associated with the next, of which it may be a variety. Hairs capitate.

Temple, N. H., (from Prof. A. B. Seymour); Ft. Mackinac, Mich., (from Prof. Wm. Trelease).

20. On the leaves of *Fagus ferruginea*. An Erineum forming very dark brown patches on the under side of the leaf, between the veins. Patches varying in shape and extent, frequently elongated, sometimes forming a continuous band between veins. Color of all the specimens seen dark brown, but probably lighter when young. When occurring on the same leaf as the preceding,

and so presumably of the same age, always the darker in color. Hairs capitate, with rather long stalks, not noticeably different from hairs on the upper surface of a leaf received from Prof. Trelease, but with longer stalks than those from the upper side of leaves from Temple, N. H.

The growth is extremely common in western Kentucky, where most of the leaves of a tree may often be seen bearing it.

Western Kentucky; Ft. Mackinac, Mich., and Wood's Holl, Mass.. (from Prof. Wm. Trelease).

EXPLANATION OF PLATE 6.

Fig. 1. Leaf of *Nyssa multiflora*, showing cecidii described as No. 1; a, section of cecidium.

Fig. 2. Leaf of *Nyssa multiflora*, showing cecidii described as No. 2; a, section of folded leaf margin.

Fig. 3. Tuft of hairs from leaf of *Potentilla canadensis*.

Fig. 4. Capitate hairs from Erineum on under side of leaves of *Retula populifolia*.

Fig. 5. Capitate hairs from No. 19.

NOTES. — The Massachusetts legislature has granted another \$75,000 to stamp out the gypsy moth.

The attention of entomologists should be drawn to an interesting paper by Mr. L. O. Howard on the biology of the Chalcididae which appears in the current Proceedings of the U. S. national museum. A mass of details concerning insect-parasitism is there brought together in a highly instructive manner which merits at least the perusal of every

person engaged in any field work; problems requiring solution are suggested by the wholesale, and clews are given to others which are well worth following. The biological side of entomology is in no danger of suffocation at the national capital with such men as Riley, Howard, and Schwarz at the front.

In the last number of *Psyche*, fig. 3 on p. 237, showing the antenna of *Goniops* enlarged, is accidentally printed upside down.



A NEW GENUS OF TACHINIDAE.

BY C. H. TYLER TOWNSEND, LAS CRUCES, N. MEXICO.

I am indebted to Professor Brauer, of Vienna, for a note to the effect that the species which I described under the name of *Meigenia hyphantriae* (Psyche, vi. 176) is not a *Meigenia*, but a new genus. I have always recognized the fact that this, and one or two other species which I have referred to *Meigenia*, did not belong there strictly. They seemed to come closest to that genus, and therefore I referred them there provisionally, until some better place could be found for them. I must, however, confess to a misconception of the genus, as originally understood by me.

The present seems a good opportunity to present a characterization of the new genus.

HYPHANTROPHAGA, n. gen.

Ashy gray species of rather less than medium size; belongs in *Tachininae* s. str. Head rather semicircular in profile; front hardly prominent, one-third to three-sevenths width of head in ♀, and about one-fourth to three-elevenths in ♂; frontal bristles descending about to base of third antennal joint, two orbital bristles in ♀ (three on right side in one ♀), none in ♂. Face receding, epistoma not prominent; facial depression three-fifths width of face in ♂, relatively narrower in ♀, moderately deep; facial ridges with a few fine bristles which extend less than half way up, slightly constricted just above oral margin where the decussate vibrissae are inserted; sides of face and cheeks bare, the cheeks about one-fifth eye-height in ♀, less in ♂. Eyes faintly and rather sparsely short

hairy in ♀, more distinctly so in ♂. Antennae somewhat shorter than face, second joint hardly elongate, third about two and a half times as long as second in ♀ and three times in ♂, narrow, not widened; arista thin, minutely pubescent, apparently 2-jointed, slightly thickened at base. Proboscis short, fleshy, labella large; palpi rather slender, slightly thickened apically. Thorax nearly as wide as head; scutellum with a weak decussate apical pair of bristles, a weak discal pair, and two strong lateral pairs. Abdomen of ♀ fully as wide as thorax, short oval, rather narrower than thorax in ♂, ovo-conical, first segment shortened; macrochaetae marginal, except on last segment which bears both discal and marginal in both sexes; hypopygium of ♂ hardly exerted. Legs rather short, not strong, bristly; claws and pulvilli elongate in ♂, much less so in ♀. Wings longer than abdomen, without costal spine, third vein bristly at base; apical cell open, sometimes very narrowly, a little before tip of wing; fourth vein bent at an obtuse angle, without stump or wrinkle, apical cross-vein slightly concave; hind cross-vein rather sinuate in ♂, usually less so in ♀, ending nearer to bend of fourth vein. Type, *Hyphantrophaga hyphantriae* Twinn., Psyche, vi. 176-177, there referred to *Meigenia*.

The above-referred to description in Psyche, of the species, was drawn from ♀ specimens only, and not from both sexes as there indicated; the whole description should be applied only to females. From a ♂ which issued August 31, and another a little later, are drawn the characteristic differences given in the above generic description, distinctive of that sex.

THE LARVA OF NOLA MINUSCULA.

BY HARRISON G. DYAR, YOSEMITE, CAL.

NOLA MINUSCULA Zeller.

1872. Zeller, Verhandl. d. k. k. zool.-bot. gesellsch., v. 22, 455.

Var. FUSCULA Grote.

1881. Grote, Papilio, v. 1, 76.

1887. Butler, Ent. amer., v. 3, 120. *pr. var.*1887. Grote, Ent. amer., v. 3, 147. *pr. var.*

The larva of this species probably has six stages, five of which I have observed.

Egg. The eggs as taken from the body of a ♀ moth are spheroidal, much flattened at base, apparently covered with large contiguous depressions; color uniform pale green; diameter about 0.33 mm.*First larval stage.* Not observed.*Second stage.* Head, cervical shield and anal plate black; width of the first 0.25 mm. Body thick and plump, not different in structure from that of the mature larva, the warts small, dark brown, bearing three or four rather short blackish hairs. Color pale whitish, with a broad diffuse brown subdorsal shade.*Third stage.* The head is now pale brown with black ocelli; width 0.3 mm. The body is as before but the brown subdorsal band is more distinct.*Fourth stage.* Head brown, the ocelli and mouth darker brown; width 0.5 mm. Otherwise much as in the next stage but the markings less distinct.*Fifth stage.* Head small, round, pale brown; width 0.7 mm. Body thick, somewhat flattened, tapering a little each way from the middle, with three rows of large, smooth, shining dark brown warts, the third row pale, bearing spreading, long, thin, white and blackish hairs. Row 1 is subdorsal, two on each segment on joints 2-4, 2 lateral and 3 subventral with some very

minute warts, 4 below. Cervical shield large, deep brown with a whitish dorsal line bisecting it. Color of body sordid white, a pair of broad deep brown subdorsal bands, somewhat irregular, narrow on joints 3 and 4 and connected by a transverse bar over the dorsum on joint 7 and sometimes also on joint 5. Length of larva 5 mm.

Sixth stage. Head as before; width 1 mm. Body wider than high, rounded, hardly tapering at all, feet as in *Nola* with only four pair of abdominal ones. Warts 1 very large, oblong as if of two coalesced, 2 and 3 also large, 4 very small, subventral. The color varies much in different examples but the ground color is nearly white or tinged with reddish, the body shaded with blackish brown more or less, having a double dorsal, two waved lateral and a straight substigmatal line of the ground color, or the black may be reduced to a few reddish streaks, but always on joints 3 and 4 is a patch of the ground color bordered by a waved subdorsal black line. Warts pale, except rows 1 and 2 on joints 5-12 which are cinnamon brown or partly blackish. Cervical shield deep shiny brown, bisected. In one the warts of row 3 are yellowish. Spiracles black. Hair of irregular length, but longest at the extremities, blackish.*Cocoon.* Elliptical, opaque, sordid white, composed of white silk, quite tough and intermingled sparsely with the larval hairs. Dimensions 8×4 mm.*Pupa.* Cylindrical, tapering each way from the middle but most posteriorly; abdomen rounded, no cremaster. Body, except the cases, covered with long, rather dense pile; color pale brown, paler on the cases. Length 6 mm.; width 1.7 mm. Duration of this stage 18 days.*Food plant.* Willow (*Salix*). The larvae

live singly, eat only the parenchyma of the leaf from the under side and hide by day in dry curled leaves that adhere to the twigs or in some other place of concealment on the branch. In this habit they differ from other Nola larvae that I have met with, which do not hide and eat the leaf from the top side only.

Habitat. Texas (Zeller), Colorado (Grote), Santa Barbara and Ventura Counties, California. It will probably also be found in the intermediate territory in the cañons and arroyos where willows grow.

A DIPTEROUS PARASITE OF THE TOAD.

In the *Zoologischer anzeiger*, jahrg. 14, no. 379, Dec. 14, '91, p. 453-455, Duncker describes an interesting case of parasitism. A number of common toads were found in the neighborhood of Kiel with their nares eaten out and their heads swollen in the buccal region. The animals moved about languidly holding their heads down and when kept in confinement rubbed their nares against the walls and floor of the terrarium "as if to relieve themselves of an itching sensation." One of the animals thus confined died and was soon afterwards found completely skeletonized. The mass in which it was buried contained many white fly larvae (8 mm. long, 2 mm. broad). These soon pupated and in about 4 weeks gave rise to more than 50 flies which proved to be *Lucilia sylvarum*. Duncker claims that the eggs or very young larvae are deposited in the nares of the toad. The larvae first eat their way backwards to the buccal region and finally devour all the soft parts of the animal, even the ligaments of the bones. He expressly states that it is not the weak and sickly toads which are selected by the flies, since he has found infected specimens that had just sloughed their skins and were to all appearances in good health. Furthermore none of the infected toads appeared to have been wounded.

HENRY WALTER BATES.

It is not in London alone that the death of Henry Walter Bates will be deplored. He was one of the four entomologists — Wallace, Weismann, and Fritz Müller being the others — who have most distinguished themselves in support of the derivative theory of organic life, and who have gained for it independent evidence from new fields of research with which their names will be indissolubly associated. With the exception of Weismann all are Europeans who gained their inspiration in Brazil, and it was there that Bates was first brought face to face with the most patent facts of mimicry.

The world has admired the unassuming attitude of Darwin and of Wallace, as well as their genius, and the same attitude may be claimed for Bates, whose striking contribution to the philosophy of mimicry was modestly hidden in a systematic essay on the butterflies of the Amazons, the title of which made no reference to the fact. Had it not been accompanied by colored plates specially illustrative of the theory there broached, and had it not appeared in the heat of the Darwinian uprise, it would have lain dormant for many a year. Yet he was the first in explanation of the facts to offer a theory worth a moment's consideration; it has since received no correction and no noteworthy modification, and stands today as clear and satisfactory a statement of the whole matter as has ever since been made.

Bates was born Feb. 8, 1825; at twenty-three he left for Brazil where he spent eleven years in collecting. On his return he published his *Naturalist on the Amazons*, which gained him the post of assistant secretary to the Geographical society, which he held until his death, Feb. 16, 1892. His systematic work was mainly in diurnal Lepidoptera and Coleoptera, especially the Carabidae, and, according to McLachlan, he left behind him an incomplete work on the classification of this family besides copious biological notes and

sketches taken in Brazil. He was a man of rugged appearance who had plainly struggled with physical ills, but whose face was lighted by sincerity and geniality, as every American who had the good fortune to meet him will recall.

EXPERIMENTS WITH CHINCH BUGS. — I notice in the second paragraph of the very interesting and important address of Professor Snow published in your last, a slight inaccuracy, to which I should not think it worth while to call attention if it did not seem that his statement as it stands might have the effect to discourage investigation of a subject scarcely touched as yet, by any one. I have never made any attempt to communicate disease to chinch bugs in the field by artificial cultures or in any other way, and hence cannot be said to have failed in this experiment. My experimental work with diseases of this insect has been hitherto limited to the laboratory, where the results have been various, but on the whole very interesting and suggestive. Professor Snow is certainly entitled to great credit for his systematic and persistent experiments with the transfer of the chinch-bug diseases by the method of contagion. The other field is as yet practically unworked.

S. A. Forbes.

PROCEEDINGS OF SOCIETIES.

CAMBRIDGE ENTOMOLOGICAL CLUB.

11 DECEMBER 1891.—The 166th meeting of the club was held at 156 Brattle St. Mr. S. Henshaw was chosen chairman.

Mr. A. P. Morse recorded the capture of *Melanoplus minor* at Sherburne and Wellesley in this State and at North Conway, N. H. According to Mr. Scudder this species has not been previously recorded from New England.

Mr. S. H. Scudder showed some plates he had recently received from Mr. W. H. Edwards of the larvae of *Papilio zolicaon* and of the various stages of *Oeneis uhleri*. This led to some discussion of the distribution of

the species of *Oeneis* and of some other boreal and alpine insects.

Mr. S. H. Scudder remarked that in consequence of the statement in his *Butterflies of New England* (p. 724-725) of the possibility of the occurrence of fleshy filaments in the earliest stages of the larva of *Anosia plexippus* on the second abdominal segment comparable to those occurring on this segment in *Tasitia berenice* or on the eighth abdominal segment in both species, he had made a very careful examination of living specimens in the first and second larval stages and found that neither on the second abdominal nor on the third thoracic segment (where filaments occur in other genera of the subfamily) could any trace of them be found.

Mr. Scudder also called attention to a new illustration of the effect of climate on the development of butterflies in some experiments made with *Oeneis semidea*. Out of a lot of eggs laid July 20-25, and widely distributed, the first young caterpillars moulted in West Virginia on August 15; by August 27 two more had changed, together with one in Philadelphia, and on September 5, one had moulted in West Virginia for the second time. In Cambridge, however, the single surviving larva was still in the first stage on Sept. 11, and the same was true at Ottawa as late as Sept. 4, at about which time one passed the first moult, and another early in October.

He then exhibited some interesting new species of Orthoptera lately received from Mr. Blatchley, from Vigo County, Indiana.

Some discussion followed with regard to the gypsy moth (*Ocneria dispar*). Mr. S. Henshaw stated that the larvae of this species are gregarious in Europe, while in this country they scatter soon after hatching.

Mr. Scudder showed a monograph of the trees which furnished the amber of the Baltic, by Conwentz, which contained notes on the diseases of these trees as caused by insects. The work is illustrated by excellent plates, and the borings of a beetle referred to *Anthaxia* and of a fly supposed to belong to *Sciara* are figured.

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The regular meetings of the Club are now held at 7-45 P.M. on the second Friday of each month, at No. 156 Brattle St. Entomologists temporarily in Boston or Cambridge or passing through either city on that day are invited to be present.

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—Fourth Report, Washington, 1885 2.00

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PHALANGIDAE.

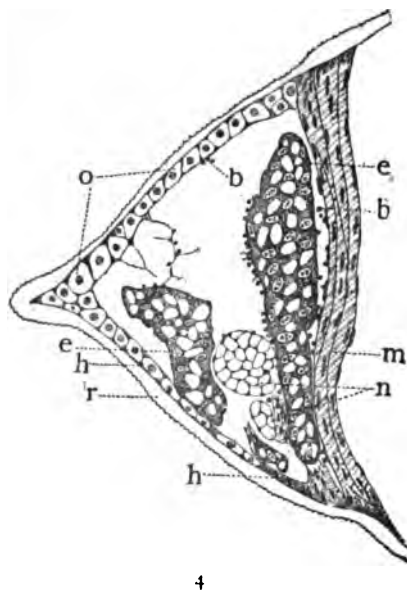
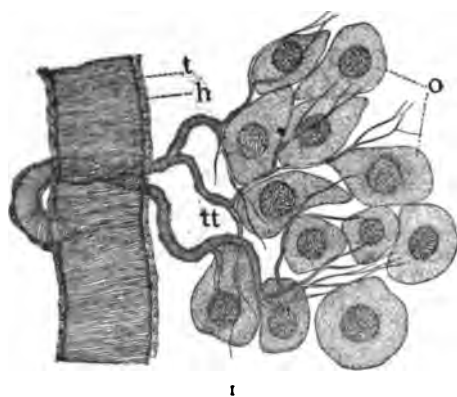
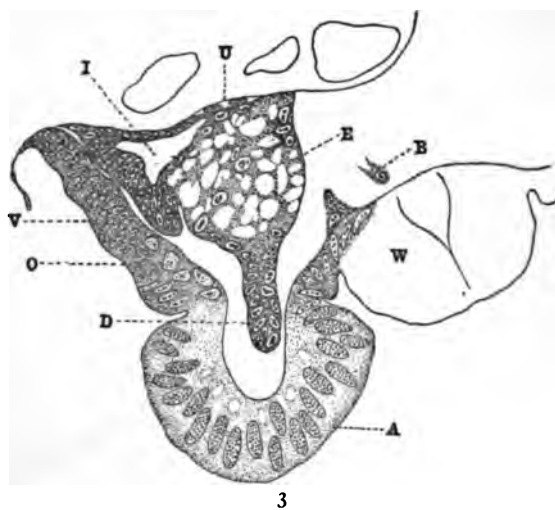
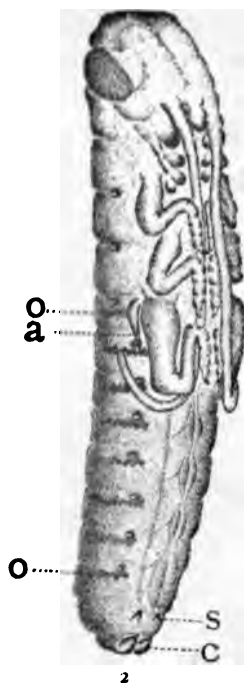
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PSYCHE.

CONCERNING THE "BLOOD-TISSUE" OF THE INSECTA.—III.

BY WILLIAM MORTON WHEELER, WORCESTER, MASS.

RHYNCHOTA. As representative of the Phytophthires the just-born young of a wax-secreting Aphid, which infests the alder, were studied. In sections the whole body-cavity was found to be filled with a reticulate fat-body, the nuclei of which measure only 3.5 μ . The oenocytes are scattered here and there throughout the reticulum apparently without any definite arrangement. They are large, brownish, opaque cells with sharp contour. The cytoplasm measures 12-18 μ ; the nucleus 5-55 μ . They seem to have no morphological connection with the fat-body but to be merely slung in its meshes. The nuclei stain deeply and present the typical finely wound chromatin skein. Some of the scattered cells were found in the three thoracic segments, whither they had probably migrated during embryonic life from the pleural walls of the abdomen. In the prothorax only two oenocytes were found and these were placed symmetrically one on either side in the pleurae.

In the mature embryo of *Ranatra fusca* oenocyte-clusters occur in five of the abdominal segments. They are huge yellow cells with nuclei rich in chromatin and are lodged in niche-like depressions of the pleural hypodermis.

My observations on the oenocytes of *Zaitha fluminea* are limited to a stage of the embryo immediately preceding revolution. I find in the abdomen, just outside the appendages and stigmata, a series of thickenings which foreshadow the compressed pleural rim of the larva and imago. The pair of these thickenings in the first abdominal segment develop excessively, bulging out conspicuously beyond the niveau of the other thickenings, so that, had I not observed that the pleuropodia are invaginate in this form and did not their tufted secretion show clearly in the very same segment, I should have supposed that I had found a pair of evaginate knob-like appendages. Sections show that the greater development of the first pair of abdominal thickenings is due to excessive proliferation of the hypodermal cells to form a solid succulent mass—the oenocytes. So many of the hypodermal elements are here converted into oenocytes, that only a few flattened and attenuated cells remain to cover the mass externally. From the surface the oenocytes may be seen shining through this thin covering and this heightens the resemblance of the two swellings to the pleuropodia of such forms as *Blatta* and *Xiphidium*. The

pleural thickenings of the second abdominal segment are also more pronounced than those of the succeeding segments but much smaller than the first pair. I could not make out that they gave rise to oenocytes. As I had no material of the later stages I was prevented from following the development of these organs further. It is possible that there are in the adult several pairs of oenocyte clusters as in other insects and that they develop from before backwards so that the stage which I studied may have shown only the formation of the first pair of anlagen. It seems to me more probable, however, that *Zaitha* develops only one pair of clusters and that the others have atrophied to such an extent as no longer to appear during ontogeny.

NEUROPTERA. In the just-hatched larvae of *Sialis infumata* a few oenocytes were found as large clear cells sticking in the pleural hypodermis between the insertions of the tergo-sternal muscles.

TRICHOPTERA. Specimens of the larvae of an unidentified Phryganeid were torn open in normal salt-solution and examined fresh or after treatment with methyl-green osmo-acetic mixture. In fresh preparations the gigantic oenocytes (Fig. 1.) are yellow, more or less rounded, and often provided with delicate processes which are attached to the tracheal hypodermis. The cytoplasm is usually finely granular; the chromatic skein of the nucleus is distinctly discernible in the unstained cell. Methyl green stains both cytoplasm and

nucleus deeply and of about the same hue. This reagent, of course, accentuates the chromatic skein. There are no nucleoli.

In some of the larvae all the oenocytes contain vacuoles. These are arranged in a broad band surrounding the nucleus midway between the nuclear and cytoplasmic walls. These vacuoles are but slightly refractive and are not fat-globules. This condition of the oenocytes was found in a number of larvae and, I believe, represents a normal physiological state. Wielowiejski has made a similar observation. One is reminded of certain gland-cells which store up vacuoles of a specific substance in their cytoplasm, preparatory to secretion.

One of the facts brought out by measurements of *Xiphidium*, viz: the gradual growth of the oenocytes with the growth of the insect, was again clearly shown in the larvae of this Phryganeid. Different stages gave the following measurements.

	Cytoplasm.	Nucleus.
1. Larva just hatched,	12.0 μ	4.6 μ
2. Larva 13 mm. long,	40.8 μ	15.6 μ
3. Larva 17 mm. long,	62.8 μ	20.3 μ
4. Larva 25 mm. long,	103.7 μ	29.5 μ
5. Larva 30 mm. long,	$\left\{ \begin{array}{l} 137. \\ 166.8 \end{array} \right. \mu$	$\left\{ \begin{array}{l} 55.2 - \\ 74. \end{array} \right. \mu$

Here the cytoplasm increases from 12. - 166.8 μ , while the nucleus grows from 4.6 - 74 μ , so that the latter undergoes a slightly greater relative increase in size. In *Xiphidium* we found the converse to hold good.

COLEOPTERA. The oenocytes of *Photuris pennsylvanica* (imago) are

of huge dimensions like those of the Trichopteran described above; their cytoplasm measuring 118.5–185. μ across, while their nuclei range from 33.5–60. μ . The cells are disposed in loose clusters in the pleural region of the abdomen and resemble their homologues in European Lampyrids.

In some Malacodermata Wielowiejski distinguished three different varieties of oenocytes according to size. In the Lampyrids he found only those of medium size—corresponding to the second variety of other Malacodermata, and suggests that in the fire-flies the “kleine oenocyten” (third variety) may be converted into the photogenetic organ. It is clear that if the “kleine oenocyten” are true oenocytes and if, moreover, Wielowiejski’s suggestion is well founded, the photogenetic organs of the Lampyridae must be ectodermal structures. If on the other hand these interesting structures originate from the fat-body, as is usually maintained, they must be mesodermal.

In *Photuris pennsylvanica* the two layers of the light-organ consist of cells which closely resemble the elements of the fat-body proper. The cells constituting the inner layer have the same size and much the same appearance; their nuclei do not differ from those of the fat-body; in the outer layer, which is more especially concerned with the photogenetic function, the cytoplasm is, of course, considerably altered, but the nuclei are indistinguishable in every particular from those of the fat-cells. The resemblance between the fat-body

and the light-organ is so great that I do not doubt their genetic relationship though I have not studied the development.

LEPIDOPTERA. Few insects appear to be better adapted for tracing out the origin of the oenocytes than the Lepidoptera. This is especially true of the larger Bombycid moths. That the segmental cell-clusters arise by delamination from the ectoderm was conclusively made out in the embryos of *Platysamia cecropia* and *Telea polyphemus*. Each cluster is several cell-layers in thickness and lies just behind and a little ventrad to an abdominal stigma. The succulent cells constituting the cluster are at first polygonal from mutual pressure, but as the time for hatching approaches, they become rounder and more loosely united. I have not traced them through the larval stages and merely record these fragmentary observations because they completely confirm Tichomiroff’s and Graber’s observations on the origin of the oenocytes from the ectoderm.

DIPTERA. Oenocytes probably occur throughout this order. To the families in which they were found by Wielowiejski (Chironomidae, Tipulidae, Culicidae, Tabanidae, Syrphidae, Muscidae, Pupipara) I would add two others (Cecidomyiidae and Simuliidae).

In the larvae of *Cecidomyia antennariae* beautiful large oenocytes occur in metameric clusters, each of which consists of about five cells. These seem not to be so regularly arranged as the oenocytes of Chironomus (Wielo-

wiejski). One cell of each cluster is situated at some distance from the others but dorsad and not cephalad as in *Chironomus*. The cells measure 45.-75. μ ; their nuclei 15. μ . They are round or slightly oval, and flattened in the same direction as the hypodermis, in niche-like excavations of which they lie.

In the young pupa they lose their connection with the hypodermis, become spheroidal and vacuolated and their nuclei decrease in size. I have failed to find any traces of oenocytes in the mature pupa and imago.

In the larva of *Simulia* the oenocytes resemble those of *Cecidomyia*.

The above insects belonging to many of the natural orders were also studied with a view to establishing the origin of the blood-corpuscles but my results were purely negative. I saw nothing to support Schaeffer's view* that the corpuscles arise from the fat-body. Such an origin is improbable *à priori* inasmuch as the cells composing the corpus adiposum are specialized for storing up fat and urates. That fat-globules and urates in the blood-corpuscles do not prove a genetic but only a physiological relationship between the fat-body and the blood is obvious if we stop to ask the question: How do the fat and urate inclusions reach the fat-body? It is most natural to suppose that they are transported thither by the blood-corpuscles. That the reverse may frequently be the case, viz: that the blood-phagocytes may

receive their fat-globules from the fat-body and carry them to other parts of the organism to be utilized in the metabolic processes which are continually taking place, is, I admit, quite as probable. But neither of these processes throws any light on the origin of the blood-corpuscles themselves.

In the embryo the blood-corpuscles probably arise from undifferentiated mesodermic tissue. They are often found in different stages of caryokinesis and I can see nothing improbable in the supposition that they may continue to multiply throughout postembryonic life. It is also probable that mesodermic cell-masses of an undifferentiated nature, associated for obvious physiological reasons with the fat-body, may function as haematogenic centres during the larval stages. For all his figures and descriptions prove to the contrary, Schaeffer's "blutbildungsheerde" may be such undifferentiated mesoderm-masses and not portions of the true fat-body at all.

In this connection I may mention a very interesting organ which I have recently found in embryos of *Blatta* and *Xiphidium* and which appears to have some physiological connection with the other members of the "blutgewebe." This is a large v-shaped mass of cells situated just beneath and attached to the inner end of the oesophagus (stomodaeum) where the two entodermic strands diverge. This cell mass lies almost wholly in the trito-cerebral (second antennary?) segment and, I believe, represents a modification of the

*Beiträge zur histologie der insekten. II. Ueber blutbildungsheerde bei insectenlarven. Sprengel's Zool. Jahrb., 3 bd. heft 4. 1889.

greater portion of the mesoderm of the segment, though this is difficult to decide. It is apparently the earliest organ to differentiate from the walls of the coelomic sacs. Its cells, at first wedge-shaped, gradually increase in size, become rounded and highly vacuolated and resemble the fat-body elements, from which they may, nevertheless, always be distinguished by their peculiar yellow tint. I have traced the organ, which is a definite circumscribed structure, and which I call, for the present, the suboesophageal body, through the embryo into the larva, where it disintegrates and finally disappears. I regard it therefore, as a truly embryonic and early larval structure, quite distinct, at least physiologically, from the fat-body. Its function is very doubtful. If the trito-cerebral segment is homologous with the second antennary segment of the Crustacea and if, moreover, the suboesophageal body really develops from the mesoderm, it may be the homologue of the "green-gland" and consequently nephridial in its nature.

Reserving a general consideration of the "blood-tissue" for future publication, I here conclude with a brief summary of the points brought out in the foregoing paragraphs:—

(1) The fat-body of the Insecta is derived from the mesoderm—being a differentiation of portions of the coelomic walls and therefore metameric in origin.

(2) The oenocytes are derived by delamination or immigration from the

ectoderm, just caudad to the tracheal involutions. They are also metameric organs.

(3) They are limited to the eight trachigerous abdominal segments.

(4) They appear to be restricted to the Pterygota, in all the members of which group they probably occur.

(5) They give rise neither to the fat-body nor to the blood but represent organs *sui generis*.

(6) After their differentiation from the primitive ectoderm they never divide but gradually increase in size.

(7) The blood-corpuscles of these insecta appear to arise early in embryonic life and perhaps also in post-embryonic life from undifferentiated mesoderm cells. The evidence of the derivation of the blood-corpuscles from the fat-body as such is unsatisfactory.

(8) The suboesophageal body arises in the trito-cerebral segment apparently from the mesoderm. Though it resembles the fat-body it must be regarded as a distinct organ. It disappears during larval life.

Clark University, Dec. 22, 1891.*

*Since the above article was written and sent to "Psyche," I have received two publications bearing on the origin of the fat-body in the insect embryo. The first is an account published in the second part of Korschelt and Heider's *Lehrbuch der vergleichenden entwicklungsgeschichte der wirbellosen thiere*, of Heymons' studies on *Phyllodromia germanica*. Soon afterwards Dr. Heymons kindly sent me a copy of his interesting paper (Die entwicklung der weiblichen geschlechtsorgane von *Phyllodromia* (Blatta) *germanica* L. Zeitschr. f. wiss. zööl. LIII. 3. 1891, p. 434-536) the lucid illustrations of which show essentially the same method of origin for the fat-body as fig. 3 in my plate. He finds, also, that other portions of the coelomic wall may contribute to the formation of the corpus adiposum.)

EXPLANATION OF PLATE 7.

Fig. 1. Cluster of oenocytes from a nearly mature Phryganeid larva. *o*, oenocytes; *t*, large tracheal branch; *tt*, smaller tracheal ramifications; *h*, tracheal hypodermis.

Fig. 2. A nearly mature embryo of *Xiphidium ensiferum*. *oo*, oenocyte clusters seen from the surface through the integument; *a*, pleuropodium of the right side (appendage of the first abdominal segment); *s*, styli (belonging to the ninth abdominal segment; the specimen being a male); *c*, cerci.

Fig. 3. Part of a transverse section through the first abdominal segment of

a young embryo of *Blatta* (*Phyllodromia*) *germanica*. *v*, pleural ectoderm; *o*, oenocytes; *a*, pleuropodium; *i*, coelomic cavity; *u*, entoderm; *w*, nerve-cord; *e*, fat-body; *b*, blood-corpusele; *d*, diverticulum of the coelomic wall, which in appendage-bearing segments becomes converted into the limb-musculature but in this segment atrophies.

Fig. 4. Part of a transverse section through one of the abdominal segments of a *Blasturus* nymph; *o*, oenocytes; *hh*, hypodermal cells; *r*, chitinous cuticle; *ee*, fat-body; *bb*, blood-corpuseles; *m*, tergo-sternal muscles; *n*, muscles in cross-section.

TACHINID PARASITE OF EUCATERVA VARIARIA GROTE, AND OTHER NOTES.

BY C. H. TYLER TOWNSEND, LAS CRUCES, N. MEX.

Along the arroyos on the mesa-lands, and near the bases of mountain ranges, in southern New Mexico, may be found growing large tree-like shrubs, with willow-like leaves, and bearing in spring numbers of rather large pink flowers, which are followed by catalpa-like seed-pods. This is known to botanists as *Chilopsis saligna*.* In August these shrubs are well stocked with the cocoons of a moth, *Eucaterva variaria* Grote, the larvae of which feed upon the leaves. The identification was made by Dr. Henry Skinner, to whom I sent a specimen of the moth. The cocoons are very lightly spun of silk, binding

the leaves together to form a part of them, and are formed on the terminal shoots. From one of these cocoons, there issued, about the 4th or 5th of September, a ♂ specimen of a Tachinid, which I can in no way distinguish from the ♂ of *Hyphantrophaga hyphanthriae* Twms. The parasite issued without going into earth, as there was none of the latter in the jar in which the cocoons were placed, but came directly from the cocoon of the moth, in which, if I remember rightly, the puparium of the Tachinid was found. This is quite a different habit from that possessed by those members of the same species which parasitize the Fall web-worm; perhaps the latter individuals

*I am indebted to Professor E. O. Wootton, of the New Mexico Agricultural College, for the name.

emerge from the earth solely because the Hyphantria cocoons are placed therein, though I have found the puparium separate from the cocoon in the earth.

Mr. Harrison G. Dyar, to whom I sent one of the Eucaterva cocoons from which the moth had emerged, wrote me as follows concerning two Tachinid eggs which he found within it, and which are doubtless those of the above species:

"There were two eggs of Tachina upon the cast skin contained in the cocoon, and both had hatched but apparently had failed to enter the larva. Probably they are eggs of the species of Tachina you have bred from the cocoons. They are elliptic ovate in outline, flat below and rounded above, smooth shining white. Under the microscope, they appear very faintly divided into minute hexagonal or circular areas. Length 0.6 mm., width 0.3 mm.

"The larvae had hatched by breaking a piece off of the pointed end. The eggs had been placed upon the body of the caterpillar, not on the head."

Meigenia websteri Twns., Can. entom., xxiii, 206. This species was recorded as bred from a chrysalis. Professor Webster sent me a portion of the chrysalis, and it has since been determined, by Dr. Henry Skinner, as belonging to *Pyrameis cardui*. Re-

garding the generic position of this Tachinid, it does not belong in Meigenia. The best place to which I can, with my present knowledge, relegate it, is in the genus *Prospheya* v. d. W. Dr. Brauer, in a letter to me, has referred it with a query to *Achaetoneura*. *Phorocera* (*Meigenia*) *promiscua* Twns. should perhaps be referred to the same genus as the preceding. It is indicated by Brauer *in litt.* as belonging either to *Achaetoneura* or *Prosopea*. If these genera can be used, it will be well to recognize them.

Tachina clisiocampae Twns. is referred by Brauer *in litt.* to *Eutachina*. This I do not approve of, as there is no necessity for the creation of the new genus *Eutachina* to contain the forms referred to *Tachina sensu stricto*.

I would like also here to make a note of the fact that Dr. Brauer informs me by letter, as also in a note of his in the Sitzungsber. k. k. zool.-bot. gesellsch. Wien, of May, 1891, that he first called attention to the relationship of the Oestridae with the Muscidae in 1858, in the Verh. zool.-bot. gesellsch. I wish, therefore, to correct my statement in the Proc. ent. soc. Washn. ii, 90, that this view was first advanced by Loew.

THE LARVA OF SARROTHRIPA REVEYANA.

BY HARRISON G. DYAR, YOSEMITE, CAL.

The larva of this species occurred abundantly on poplar at Yosemite, Cal., in July. The moths emerged the same

season in August and I obtained them at this time in 1889 and 1891. When I first noticed the larvae living grega-

riously under their silken web on the fresh terminal leaves of new shoots, I supposed them to be Tortricid larvae, and came near neglecting to rear them. A large proportion of the new shoots of the poplar (*Populus balsamifera*) in the valley were infested with these larvae.

I have not seen any record of the occurrence of this species in the United States, except that the name is given in Hy. Edwards's Catalogue of transformations of North American Lepidoptera with three references to European authors. I have been enabled to determine these moths to belong to the European species from some figures which my sister, Mrs. S. Knopf, kindly made for me at Paris, France.

I believe that there are five larval stages, but I have not observed them in sequence and I have not seen the egg.

SARROTHRIPA REVEYANA S. V.

Egg. Not observed.

First larval stage. Head rounded, partly retracted under joint 2, furnished with a few hairs; width 0.4 mm. Body apparently like that of the mature larva; a few hairs. (Described from a dead discolored specimen.)

Second stage. Like the mature larva except in size; pale yellowish green, smooth; hairs whitish, curling backward. Width of head 0.6 mm.

Third stage. Only the cast head-case was observed; width 0.9 mm.

Fourth stage. Width of cast head-case, 1.2 mm.

Fifth stage. Head round, pale greenish,

not shiny; ocelli black, mouth white, jaws brown; a few hairs; width 1.8 mm. Body cylindrical, folded between the segments, tapering slightly from the middle to the extremities; feet normal. Hairs few, fine and long, white, growing from the skin, there being no warts nor tubercles perceptible even with a glass, but the single hairs are arranged in the same manner as the warts of the Arctiidae; row 4 is just below the stigmatal line and the hairs each a little back of a spiracle; 5 anteriorly and 6 posteriorly on the segments in the subventral space, and 7 consists of four small hairs on the venter of the legless segments. Body velvety yellowish green, subtranslucent, the dorsal vessel darker; a very faint yellowish stigmatal line; feet tipped with brown; spiracles minute, ochreous. The larvae live gregariously or, more rarely, singly under a silken web spun on the upper side of a tender leaf some distance above the surface. They will not eat the old hard leaves.

Cocoon. Composed entirely of white opaque silk and spun between two leaves or in some other place that will furnish the necessary support for the first vertical threads against which the cocoon is built. It recalls in shape the cocoon of *Nola trinotata*, but contains no bark and is larger and thicker. The base is flat, the sides nearly straight, and one end is pointed above, from which the top slightly tapers to the other end. The end below the point opens like a pair of vertical doors for the emergence of the moth.

Pupa. Cylindrical, thorax rounded, abdomen only very slightly tapering, the last segments rounded; cremaster none. Smooth, pale whitish with a brown tinge and a broad dark brown dorsal shade running the whole length. Length, 10 mm.; width, 3 mm.

Food plants. Poplar (*Populus*) and willow (*Salix*).

Larvae from Mariposa Co., California.

NOTE.—A study of California butterflies and especially their comparison with those of Eastern America and Europe leads S. H.

Scudder in the Overland monthly for April to claim that the highest type of human civilization is to arise on the Pacific coast.

SYNONYMY OF BUTTERFLY PARASITES.—

A critical study of the American *Apanteles* parasitic upon butterflies convinces me that there are but four species instead of the sixteen described by Prof. Riley in Mr. Scudder's *Butterflies of the eastern U. S.* These are *A. megathymi* (ovipositor long, stigma white), *A. carpatus* (ovipositor long, stigma dark), *A. caspius* (ovipositor concealed, two deep diverging grooves forming a triangle on disk of second segment), and *A. glomeratus* (ovipositor concealed, no triangle on disk of second segment).

A. Edwardsii, *emarginatus* (*ensiger* Say) are synonyms of *A. carpatus* Say; the others are synonyms of *A. glomeratus*; *A. theclae* is a well marked variety of *A. glomeratus* Linn.

Wm. Hampton Patton.

ENTOMOLOGICAL NOTES.—It is stated in *Science* that the friends of the late Henry Edwards have subscribed \$10,000 and the American Museum of Natural History \$5,000 for the purchase of his entomological collection, consisting of more than 350,000 specimens, and this scientific treasure goes to the American Museum. This enterprise has been carried through by Mr. A. M. Palmer, and other theatrical friends of Mr. Edwards.

More than half of the "Supplementary appendix" Mr. Whymper has recently published to his travels amongst the Great Andes is given up to Coleoptera, and almost the whole of it to insects with numerous excellent woodcuts engraved by Whymper himself. The introduction by the late H. W. Bates gives a *coup d'oeil* of the whole collection mostly made over 9000 and even over 11000 feet above the sea, and shows that there is no trace of "any distinct element of a north temperate or south temperate coleopterous fauna on the Ecuadorian Andes . . . A few genera belonging to temperate latitudes, though not found in the tropical lowlands, do indeed occur, but they are forms of almost world-wide distribution in similar climates, and there is no representative of the numer-

ous characteristic and common genera of the north or south. Even the northern genera more or less abundantly found on the Mexican highlands are absent." So, too, among the butterflies, "the genera *Erebia*, *Chionobas*, *Parnassius*, *Argynnis*, *Epinephele*, and many others, so highly characteristic of the faunas of the north temperate zone or Chili, or both, and of high vertical ranges, are quite absent." It seems to Bates a fair deduction that "no distinct traces of a migration during the lifetime of existing species from north to south, or vice versa, along the Andes, have as yet been discovered or are now likely to be discovered."

The March number of the *Entomologists' monthly magazine* contains an interesting account by W. W. Smith of the formation of new colonies and nests by two species of New Zealand ants of the genus *Tetramorium*. According to him they originate by the union of several individuals of both sexes on sites beneath stones among the roots of plants already instinctively selected and inhabited by Aphides and Coccids, which serve as an economic basis while founding their nests.

PROCEEDINGS OF SOCIETIES.

CAMBRIDGE ENTOMOLOGICAL CLUB.

8 Jan., 1892. The 167th regular meeting and 16th annual meeting (since incorporation) was held at 156 Brattle Street. Mr. J. H. Emerton was elected chairman.

The annual report of the retiring Secretary, Mr. R. Hayward, was read and accepted. Mr. S. Henshaw, the retiring Treasurer, presented his annual report which was accepted subject to the approval of the auditors. The retiring librarian, Mr. S. H. Scudder, presented a verbal report of the condition of the Club library which was accepted.

The election of officers for 1892 being next in order the Club proceeded to ballot, and the following officers were declared elected:

President, Rev. W. J. Holland, of Pittsburgh, Pa.; Secretary, Roland Hayward; Treasurer, Samuel Henshaw; Librarian, Samuel H. Scudder; Members at large of Executive Committee, J. H. Emerton and S. H. Scudder.

The Secretary announced that the address of the retiring President had not been received.

Voted to authorize the Treasurer to sell the non-entomological works in the Club's library and devote the proceeds to the payment of debts incurred in the publication of vol. 5 of *Psyche*.

Mr. S. H. Scudder gave a brief account of his studies of the tertiary Rhynchophora of North America of which he had just completed a monograph for the U. S. geological survey.

Mr. J. H. Emerton showed drawings of various Thomisidae and remarked briefly on work which he had recently been doing in this family.

Mr. A. P. Morse recorded the capture of *Melanoplus junius* Dodge at Jackson, N. H., Jay, Vt., Montgomery, Vt., and North Conway, N. H., from July 3-30. He also stated that he had taken a specimen of *Hesperotettix viridis* at Wellesley, Mass.

12 February 1892.—The 168th meeting of the club was held at 156 Brattle St., Mr. S. Henshaw in the chair. Mr. A. P. Morse was chosen secretary pro tempore.

A letter from Dr. W. J. Holland was read accepting the office of president of the club for the ensuing year. It was voted to make Mr. B. Pickman Mann a life-member in consideration of his striking off fifty dollars of the indebtedness due him on account of vol. iv of *Psyche*.

The address of the retiring president, Prof. F. H. Snow, of the University of Kansas, on "Experiments for the destruction of chinch bugs by infection", was read by Mr. Scudder.

Mr. S. H. Scudder exhibited some beetles from Sonora, Mexico, of the genus *Caryobarus*, family Bruchidae, with the palm-seeds from which they emerged. Also, with critical remarks, some inflated larvae he had

recently received of several European and Asiatic butterflies.

11 March, 1892.—The 169th meeting was held at 156 Brattle St., Mr. S. H. Scudder in the chair.

In showing the recent additions to the library, the librarian called attention to a paper by Dr. Urech on the colors of the scales of butterflies addressed to the Club by the author, the address being written "with the decocted wing colors in butterflies of *Vanessa urticae*."

Mr. S. H. Scudder exhibited a series of about 500 specimens of the Orthopteran genus *Hippiscus* which had served as the base of a study of the group he had recently completed. Saussure in 1884 and 1888 had separated two groups which he regarded as genera, *Hippiscus* and *Xanthippus*, and had placed in the former seven species, in the latter ten, with one he had not seen in an uncertain position, in all eighteen species. In this revision they are divided into three groups regarded as subgenera, *Hippiscus* with eleven species, five of them new; *Stichtippus* (not seen by Saussure) with two species, both of them new; and *Xanthippus* with twenty-five species, fifteen of them new; in all thirty-eight species. Two of Saussure's species, *Hippiscus ocelote* from Mexico and *Xanthippus lateritius* from Nevada, not seen, are included in these, some few changes in specific nomenclature have been required, and one species provisionally placed by Saussure in *Xanthippus* has been removed elsewhere; a different arrangement of the species is proposed, particularly in *Hippiscus*, and two described species not seen by Saussure are definitely placed.

He also exhibited some blood-red larvae about 5 mm. long brought him as having been sent from Berkshire Co. by a man who thought they had fallen in myriads with the last fall of snow. They appeared to be of a species of *Sciara* or allied genus of flies, and their occurrence in midwinter, full grown and living on the surface of snow, appeared to be new.

PSYCHE,

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PSYCHE.

THE ORTHOPTERAN GENUS HIPPISCUS.

BY SAMUEL H. SCUDDER, CAMBRIDGE, MASS.

Hippiscus was established by Saussure in 1861 as a subgenus of Oedipoda on a large Mexican grasshopper to which he gave the name of ocelote. Only a brief diagnosis of the group was given, and no attention was paid to it until 1873, when Stål, who regarded it as a genus, gave much greater precision to its definition through the tables in his *Recensio Orthopterorum* and placed Serville's well known *Oedipoda discoidea* in the group. Subsequently, in 1874, I referred here *Oe. rugosa* Scudd. and, in 1876, *Oe. neglecta* Thom., *Oe. haldemanii* Scudd. and *Oe. corallipes* Hald. Finally, in 1884, Saussure in his *Prodromus Oedipodiorum* described a number of new forms and separated them into two series, which he termed Hippiscus and Xanthippus, regarding each as a genus, and further divided the former into two subgenera, — Hippiscus proper and Pardalophora.

Although I have been unable to examine two of the species described by Saussure, so large a number of new forms have been found in our country, especially in the region west of the Mississippi, and so great a confusion exists regarding them in our collections and in the writings of our entomologists, that I have

ventured to subject them all to a critical study, the result of which is offered in the following pages. As will be seen, I am inclined to regard Saussure's two genera as but subdivisions of one generic group, and to discard his subgenus Pardalophora altogether; at the same time I have applied a third subgeneric name, Sticthippus, to forms which are closely related to Hippiscus and Leprus. My *Leprus ingens* which Saussure, without seeing, put in Xanthippus with a query, I am now inclined to regard as the type of an undescribed genus allied to Leprus but distinct and remarkable for the bulky form of the female.

Though it seems most reasonable to consider these subdivisions as of less than generic rank, there would seem to be ground for regarding them as of some importance, for it will be noted by the observant that the subgenus Hippiscus is an eastern type, rarely occurring beyond the Sierra Nevadas*, and that Sticthippus is confined to the Pacific slope, while Xanthippus occurs with Sticthippus on the Pacific Coast, and

*Exception may possibly be made to this, for Walker records *H. tuberculatus* from the West Coast; but apart from the fact that this species forms a group by itself within Hippiscus and has an anomalous distribution even to within the Arctic Circle, I believe this is either an error of determination or of location.

with *Hippiscus* throughout the centre of the continent, but is altogether wanting on the Atlantic coast, no species occurring nearer than Iowa, Nebraska, and Kansas; none even reach the Mississippi River.

In the preparation of the present paper I have studied more than five hundred and fifty specimens, the larger part of which were in my own collection, but

I have had the advantage of seeing all those in the collection of Mr. Samuel Henshaw of Cambridge, and a full series of those belonging to Mr. Lawrence Bruner of Lincoln, Neb. to both of whom I am indebted for many courtesies. Dr. C. V. Riley has also kindly sent for my examination types of two or three of Thomas's species of which I was in doubt.

TABLE OF THE SPECIES OF HIPPISCUS.

- A*¹. Antennae of male not attenuate or arcuate at the extremity; carina of pronotum intersected only by the typical sulcus, which is obsolete or rapidly fades out on the lateral lobes; posterior femora generally more dilated and the inferior border more arcuate.
- B*¹. No distinct sunken biareolate area at the summit of the frontal costa; if vaguely present, separated from the costa below by no carina or angle. Lateral walls of normal discal scutellum of prozona not cut deeply by an inner fork of its posterior sulcus, which indeed often does not exist. Medina carina sharply distinct throughout. Markings of the tegmina usually pantherine. Mesosternal lobes separated by a piece rather quadrate than truncato-cuneate, though the posterior corners of the lobes are rounded, but narrowly and abruptly. . . . (HIPPISCUS.)
- c*¹. Anterior extremity of scutellum of vertex not prolonged, narrowing rapidly, in front (excl. *H. pantherinus*) as broad as or broader than half the middle width; hind margin of pronotum usually rectangulate; markings of tegmina distinctly pantherine.
- d*¹. Frontal costa distinctly, often considerably, narrowed at its upper extremity, except in some ♀ hardly or even less than a fourth the width of the space between the eyes, the scutellum of the vertex rarely furnished with transverse carinae, then generally faint, and the longitudinal carina terminating in the centre with rare exceptions; tips of the wings in the ♂ rarely or but slightly clouded; extreme base of the area of the ulnar fork of tegmina usually not involved in the darker markings; calcaria of opposite sides of hind tibiae subequal.

- e*¹. The lower third of tegmina free from dark markings, except in the anal area; markings of tegmina hardly pantherine; tegmina tapering and basal lobe of costal margin prominent, the width of the tegmina at this point being fully a third greater than at the tip of the lower ulnar vein; lateral carinae of pronotum not very sharp. (*H.*) *phoenicopterus*.
- e*². Not more than the lower fourth of tegmina, if any, free from dark markings; markings of tegmina distinctly pantherine; tegmina subequal and basal lobe of costal margin less pronounced, the width of the tegmina at this point being scarcely more than a sixth greater than at the tip of the lower ulnar vein; lateral carinae of pronotum sharp.
- f*¹. Vertical scutellum hexagonal or heptagonal, broader than long, the sides very rapidly narrowing in front and distinctly angulate next the front edge of the eye; light transverse markings of apical half of tegmina scarcely more than half as broad as the darker markings. (*H.*) *pantherinus*
- f*². Vertical scutellum longer than broad, pyriform, the sides distinctly rounded and less rapidly narrowing; light markings of apical half of tegmina almost or quite as broad as or even broader than the darker markings.
- g*¹. Granules on dorsum of metazona by their confluence distinctly following lines forming oblique rugae parallel to the hind margin; lateral canthi of pronotum as distinct and sharp on the hinder part of the prozona as on the front part of the metazona. (*H.*) *haldemanii*.
- g*². Granules on dorsum of metazona rarely confluent and when confluent showing no marked tendency to follow lines parallel to hind margin; lateral canthi of pronotum much less distinct and duller on hinder part of prozona than on front part of metazona. (*H.*) *texanus*.
- d*². Frontal costa not at all or scarcely in the least narrowed at its upper extremity, always more than a third, sometimes nearly a half, the width of the space between the eyes, the scutellum of the vertex divided by longitudinal and transverse carinae into four subequal quadrants; tips of the wings in the ♂ usually clouded, the large central dark spot of the tegmina usually involving the extreme base of the area of the ulnar fork of the tegmina; calcaria of hind tibiae markedly unequal on opposite sides.
- e*¹. Lateral canthi of pronotum not very sharp, interrupted and devious between the sulci; metazona of ♀ distinctly longer than prozona.

- f*¹. Relatively slenderer forms, the tegmina relatively slenderer; last, forked branch of the discoidal vein of the hind wings usually arising about three fifths the distance from the base to apex of the wing, and in ♂ usually well within the limits of the transverse fuscous belt; closed tegmina of ♂ surpassing the abdomen by at least one fourth their length. . . . (*H.*) *rugosus*.
- f*². Relatively stouter bodied forms, the tegmina relatively broader; last, forked branch of the discoidal vein of the hind wings usually arising at about two thirds the distance from the base to apex of the wing, and in ♂ at the outer edge of the transverse fuscous belt; closed tegmina of ♂ surpassing the abdomen usually by less than one fourth their length.
- g*¹. Dark markings of outer fourth of tegmina clustered into regular connected transverse series. . . . (*H.*) *compactus*.
- g*². Dark markings of outer fourth of tegmina forming irregularly distributed minor maculations.
- h*¹. Markings of tegmina distinctly pantherine, marginal field with numerous small blotches; wings of ♂ fully twice as long as broad; hind margin of prothorax rectangulate. (*H.*) *variegatus*.
- h*². Markings of tegmina hardly pantherine, resembling many species of *Trimerotropis*, marginal field mostly occupied by two large spots; wings of ♂ scarcely twice as long as broad; hind margin of prothorax obtuse angulate. . . . (*H.*) *suturalis*.
- e*². Lateral canthi of pronotum acute, continuous throughout, arcuate; metazona of ♀ scarcely longer than the prozona. (*H.*) *ocelote*.
- c*². Anterior extremity of scutellum of vertex prolonged, narrowing gradually, in front less than half as wide as in the middle; hind margin of pronotum acutely angled (rarely, by variation, rectangulate); markings of tegmina hardly or not at all pantherine.
- d*¹. Metazona with two pairs of distinct lateral rugae parallel to hind margin; basal discoidal field of tegmina, including the ulnar area, broadly maculate; apical half of tegmina multimaculate; ulnar taenia of hind wings stopping far short of the base of the wing, the intermediate space filled with closely crowded cross veins; veins at end of humeral field more or less laterally stained with blackish fuscous at the cross veins, rarely absent. (*H.*) *saussurei*.
- d*². Metazona without lateral oblique rugae; basal discoidal field of tegmina, and especially the ulnar area, almost or quite immaculate; apical half of tegmina paucimaculate; ulnar taenia of hind wings almost reaching the base of the wing, the cross veins next the

base not closely crowded; veins attend of humeral field immaculate. (H.) *tuberculatus*.

- B*². At the point where the scutellum of the vertex and the frontal costa meet, between the apices of the lateral foveolae, a distinct sunken transversely biareolate field or frontal fastigium easily distinguished both from the vertical scutellum and the frontal costa. Posterior sulcus of the prozona terminating on the typical sulcus in two forks, one at the lateral borders of the normal discal scutellum, the other, by deeply cutting the lateral walls of that scutellum, close to the median line. Median carina of metazona posteriorly more or less subobsolete in the ♀. Markings of the tegmina not distinctly pantherine. Mesosternal lobes separated by a truncate but distinctly wedge-shaped median piece, the posterior corners of the lobes being very broadly rounded.

(STICTHIPPIUS.)

- c*¹. Axillary vein of tegmina of ♀ in no way entangled with the anal vein; maculations of apical third of tegmina obscure; humeral field of wings uniformly infuscate apically. . . . (S.) *californicus*.

- c*². Axillary vein of tegmina of ♀ more or less entangled apically with the anal; maculations of tegmina as distinct on apical third as elsewhere; humeral field of wings apically maculate.

(S.) *marmoratus*.

- A*². Antennae of male attenuate or arcuate, in dried specimens often partly coiled at the extremity; carina of pronotum intersected by two sulci, and generally obliterated between them, but sometimes indicating the anterior sulcus only by sinuation; posterior femora generally less dilated, the inferior border less arcuate.

(XANTHIPPIUS.)

- ♂*¹. Antennae of ♂ usually as long as the hind femora, gradually attenuated apically for at least one fifth their length, curled, cochleate, or hooked at the tip in drying. Tegmina distinctly pantherine in markings, occasionally obscured (in variation) by obsolescence; intercalary vein arcuate, approaching at least twice as close to the median at its apex as near its base. Fuscous transverse band of wings so far removed from apex as to leave a vitreous area, especially in the ♀, covering four marginal lobes or even more. Pronotal carina with rare exceptions more or less obliterated between the principal sulci. Summit of cranium commonly carinulate between the eyes.

- c*¹. Male of medium or large size. Tegmina surpassing the abdomen in both sexes; area of the ulnar fork rarely filled with only a single,

usually with a complete double, row of cells. Metazona usually tumid centrally to a greater or less extent, and considerably depressed or indentate anteriorly on either side the median carina.

- a*¹. Intercalary vein of tegmina near its extremity running so close to the median as commonly to be hardly separated from it by more than its own thickness; markings of tegmina sharp and well defined; transverse band of wings distinctly narrowed, sometimes obsolescent, at the anal vein; process of metazona normally less than a right angle.
- e*¹. Bounding walls of the vertical scutellum and other carinae of the vertex generally dull and low; metazona about two thirds as long again as the prozona, its dorsum variable, its rugosities not very prominent, rarely confluent; transverse fuscous band of wings usually very broad, in the second lobe below the anal vein often more than twice as broad as the width of the lobe.
- f*¹. Species of great size; maculations on apical third of tegmina often obscure by lack of depth of color, lessening the contrasts between the darker and the lighter spots, but sometimes sharp and well defined; fuscous band of wings generally very dark; inside of hind femora usually blue except the red apical third.
(*X.*) *corallipes*.
- f*². Species of rather small or medium size; maculations on apical third of tegmina generally pure and with distinct contrasts; fuscous band of wings generally fuliginous; inside of hind femora usually wholly red. (*X.*) *zapotecus*.
- e*². Bounding walls of the vertical scutellum and other carinae of the vertex usually sharp and relatively high; metazona twice as long as prozona, its dorsum centrally tumid, its rugosities prominent and usually more or less confluent; transverse fuscous band of wings usually narrow or moderate, in the second lobe below the anal vein rarely so much as twice the width of the lobe.
- f*¹. Transverse pale band of anterior margin of tegmina opposite the middle of intercalary vein but little broader than the others; fuscous band of wings narrow, hardly touching the margin anywhere and often widely interrupted between the arcuate fascia and the humeral vitta.
- g*¹. Darker markings occupying one half or more of the tegmina, normally and completely continuous in the middle half of the tegmina and usually broader than the pale interspaces.
(*X.*) *conspicuus*.

- g*². Darker markings occupying much less than one half of the tegmina, broken or partially broken by the nervules into maculations in the middle of the tegmina and usually narrower than the pale interspaces. (*X.*) *eremitus*.
- f*². Transverse band of anterior margin opposite middle of intercalary vein much, generally twice or more, broader than the others; fuscous band of hind wings moderately broad, reaching the margin over half its course and hardly or but slightly interrupted at the anal vein. (*X.*) *pardalinus*.
- d*². Intercalary vein of tegmina separated near extremity from the median by a moderately wide space; markings of tegmina often somewhat blurred or ill defined, but sometimes perfectly sharp; transverse band of wings generally narrowed somewhat at the anal vein, but less noticeably than in the alternative category and never obsolescent; process of metazona normally rectangular.
- e*¹. Fuscous markings of the apical half of tegmina hardly occupying so much as half the space, arranged in generally transverse, well defined blotches rarely so long as half the breadth of the tegmina.
- f*¹. Rugosities of dorsum of pronotum irregularly distributed; median carina of metazona but slightly elevated, scarcely arched; transverse fuscous bars of tegmina with tolerably regular, rounded, and sharply limited outlines; hind femora distinctly and very obliquely barred exteriorly. (*X.*) *maculatus*.
- f*². Rugosities of dorsum of metazona more or less distinctly ranged into series parallel to the two sides of the process; median carina of same considerably elevated, distinctly arched; transverse fuscous bars of tegmina scarcely rounded, with ill defined irregular margins on apical half; hind femora obscurely or not at all barred exteriorly. (*X.*) *tigrinus*.
- e*². Fuscous markings of apical half of tegmina occupying fully three fourths its area, arranged in well defined transverse bars nearly or quite crossing the tegmina.
- f*¹. Dorsum of prothorax with very prominent, often sharp, rugosities; fuscous band of wings very broad, not at all narrowed at the anal vein. (*X.*) *leprosus*.
- f*². Dorsum of prothorax with less prominent, though coarse but dull rugosities; fuscous band of wings narrow or if of medium width then distinctly and considerably narrowed at the anal vein.
(*X.*) *paradoxus*.

- e*¹. Fuscous markings of apical half of tegmina irregularly maculate with a tendency to a transverse arrangement but with ill defined very irregular margins and occupying perhaps half the whole area.
- f*¹. Dorsum of prothorax more heavily and coarsely rugulose; tegmina relatively long, distinctly surpassing the abdomen in the ♀; the darker tints of the tegmina generally prevail over the lighter, particularly in the middle of the tegmina; fuscous band of wings relatively broad. (*X.*) *affrictus*.
- f*². Dorsum of prothorax less heavily and coarsely rugulose; tegmina relatively short, not exceeding the abdomen in the ♀; darker tints of tegmina subordinate to the lighter, particularly in the middle of the tegmina; fuscous band of wings relatively narrow. (*X.*) *toltecus*.
- c*². Male of small size. Tegmina of ♀ shorter than the abdomen; area of the ulnar fork rarely filled with more than a single row of cells and then only for a portion of its length. Metazona plane above, with obscure or no indentation anteriorly.
- d*¹. Shoulder (or extreme base of front margin) of tegmina as dark as the rest of the base; markings of tegmina more or less obscure and blurred. (*X.*) *altivolus*.
- d*². Shoulder of tegmina with paler markings contrasting with the rest of the dark base; all markings of tegmina sharp and distinct.
- e*¹. Antennae of ♀ almost as long as the pronotum; pronotum of ♀ nearly half as long again as its extreme dorsal width. (*X.*) *cupidus*.
- e*². Antennae of ♀ considerably shorter than the pronotum; pronotum of ♀ but little longer than its extreme dorsal width. (*X.*) *pumilus*.
- δ*². Antennae of ♂ distinctly shorter than the hind femora, apically attenuate for rarely more than one eighth their length, at most arcuate or broadly uncinat in drying. Tegmina rarely though sometimes distinctly pantherine, usually irregularly mottled with moderately large alternate blotches of dark fuscous and gray, and apically dotted with pale fuscous; intercalary vein usually straight, rarely approaching the median much nearer at its apex than next its base, never more than twice as close. Fuscous transverse band of wings so near the apex that even in the ♀ rarely more than two marginal lobes are covered by the sometimes apically infuscated vitreous area. Pronotal carina sometimes scarcely subdued between the principal sulci. Summit of cranium commonly not carinulate between the eyes.

- c¹. Median carina of pronotum usually almost entirely obliterated between the anterior and principal sulci; markings of the tegmina distinctly pantherine; inferior carina of hind femora high and strongly arcuate.
- d¹. Markings of tegmina mostly confined to the anterior half or three-fifths; apex of axillary field pallid; fuscous band of wings somewhat obscure, very narrow, narrowed at the anal vein; hind tibiae yellow. (X.) *albulus*.
- d². Markings of tegmina crossing them; apex of axillary field dark; fuscous band of wings distinct, very broad, not narrowed at the anal vein; hind tibiae red. (X.) *latefasciatus*.
- c². Median carina of pronotum usually distinct between the anterior and principal sulci; markings of the tegmina not pantherine but more or less marmorate, much after the pattern of *Trimerotropis*; inferior carina of hind femora usually normal, rarely high or strongly arcuate.
- d¹. Lateral lobes of pronotum slightly wider below than in the middle by the retroarcuate curve of the hind margin; inferior carina of hind femora not prominent.
- e¹. Band of hind wings broad, leaving not more than two lobes apically free. (X.) *obscurus*.
- e². Band of hind wings usually less broad, leaving more than two lobes apically free. (X.) *neglectus*.
- d². Lateral lobes of pronotum equal, the hind margin vertical and not retroarcuate; inferior carina of hind femora more or less prominent.
- e¹. Lower intercalary area of tegmina broad, densely filled with anastomosing nervules, generally more densely than in the area beneath it; lateral canthi of thorax almost entirely confined to metazona.
- f¹. Vertical fastigium shallow with low lateral walls, the frontal fastigium (or the front part of the vertical fastigium at its junction with the frontal costa) not deeply impressed, widely connected with the vertical fastigium. Antennae in both sexes as long as the head and pronotum. Hind margins of metazona entire; anal line of tegmina pallid; axillary vein of tegmina free. (X.) *montanus*.
- f². Vertical fastigium deep with high walls, the frontal fastigium deeply impressed, with a constricted connection with the vertical fastigium. Antennae of ♀ shorter than the head and pronotum. Hind margins of metazona crenulate; anal line of tegmina concolorous; axillary vein of tegmina apically united to the anal.

- g*¹. Frontal costa much more constricted above than below the ocellus; wings bright red or yellow at base.
- h*¹. Anterior portion of metazona transversely plicato-rugose; axillary vein united distally with the anal. (*X.*) *lateritius*.
- h*². Anterior portion of metazona rugose without sign of transverse plications; axillary vein free or intermediately united distally with the anal. (*X.*) *calthulus*.
- g*². Frontal costa scarcely more constricted above than below the ocellus; wings pale lemon yellow at base. (*X.*) *griseus*.
- e*². Lower intercalary area of tegmina not always broad, no more densely filled with anastomosing nervules than the area beneath; lateral canthi subcontinuous across thorax and straight. Process of metazona rectangulate.
- f*¹. Median carina of pronotum distinct throughout the prozona and scarcely less so between the principal sulci than in front; outer border of band at apex of wing distinct. (*X.*) *vitellinus*.
- f*². Median carina of pronotum nearly obliterated between the principal sulci; outer border of band at apex of wings often obscure.
- g*¹. Markings of tegmina relatively distinct and abundant, the apical half distinctly mottled; the postmedian spot large and no more conspicuous than the others; arcuate band of wings nearly or quite reaching the anal angle. (*X.*) *aurilegulus*.
- g*². Markings of tegmina scant and obscure, the apical half dark fuliginous with few or no mottlings; the postmedian spot small and more conspicuous than the others; band of wings hardly reaching more than half way to anal angle. (*X.*) *stigmatosus*.

Subgenus HIPPISCUS.

HIPPISCUS (H.) PHOENICOPTERUS.

Oedipoda phoenicoptera Germ!, Burm., Handb. ent., 2, 643.

Hippiscus phoenicopterus Sauss., Prodr. Oedip., 87; McNeill, Psyche, 6, 63.

Oedipoda discoidea Serv!, Hist. nat. Orth., 724; Scudd!, Bost. journ. nat. hist., 7, 469; Glov., Ill. N. A. ent., Orth., pl. 3, figs. 3, 7; Thom., Syn. Acrid. N. A., 133-135.

Hippiscus discoideus Stål, Rec. Orth., 1, 121; Thom., Bull. Ill. mus., 1, 66; Rep. ent. Ill., 9, 95, 116-117; Scudd!, Proc. Bost. soc. tan. hist., 19, 90.

In the collection at Halle I saw a ♂ of this species labelled *Oe. phoenicoptera* in Burmeister's handwriting and purporting to come from South Carolina collected by Zimmermann; though not marked as a type specimen, there can be little doubt that it is one of the types, and I am thus able to correct (as others have already done) the mistake of my earliest reference to this species. I have also seen the Georgia type of Serville's *Oe. discoidea* in the Jardin

AN APORIA BRED FROM LIMACODES SP.

BY C. H. TYLER TOWNSEND, LAS CRUCES, N. MEX.

The Tachinid described below occurs in a lot of Tachinidae sent me by Professor Comstock, from Ithaca, N. Y. Aside from the knowledge of its parasitism, it is of peculiar interest as belonging to the genus *Aporia*, hitherto recorded only from South America. This genus differs from *Exorista*, to which it is nearly allied, by the frontal bristles not descending below base of antennae, and the antennae being inserted below a line drawn through the middle of the eyes. The third antennal joint is also considerably narrowed, and the whole body is very bristly.

Aporia limacodis n. sp. ♂. Eyes cinnamon brown, thickly pubescent; front very narrow, about as wide as one of the antennal joints on posterior half, gradually widening before; frontal vitta nearly obsolete behind, wide and triangular in front, velvet brown; frontal bristles moderately strong and all directed forward, absent just before ocelli, ocellar and vertical bristles hardly to be distinguished, all directed forward, no orbital bristles; sides of front, face and cheeks silvery white, the cheeks hardly one-third eye-height and with a few bristles on lower portion, sides of face narrow and bare; vibrissae decussate and inserted on oral margin, facial ridges bare except several bristles next vibrissae; antennae and arista black, first two antennal joints and base of third rufous; proboscis short, fleshy, brownish, labella large and tawny; palpi not large, rufous, bristly, a little enlarged apically; occiput silvery, clothed with gray hairs. Thorax wider than head or abdomen, shin-

ing black, rather thinly silvery white pollinose, with four black vittae, the outer ones interrupted at suture, humeri and pleurae more distinctly silvery white pollinose; scutellum black, silvery, with an apical decussate pair of macrochaetae and two lateral ones, the posterior lateral ones strongest. Abdomen narrower than thorax, long conical, very bristly and hairy, shining black, basal half or more of segments two to four silvery white pollinose, first segment silvery beneath and faintly so on sides above; first segment with a strong lateral macrochaeta and a median marginal pair; second with a median discal pair and a marginal row of six or eight; third with a median discal pair and a marginal row of ten; anal beset with macrochaetae except at base, second and third segments with median anterior and submarginal pairs of macrochaeta-like bristles. Legs rather long, blackish, front femora silvery white pollinose on outside, tibiae pale brownish rufous, bristly, claws and pulvilli elongate, pulvilli smoky yellowish. Wings longer than abdomen, rather hyaline, somewhat grayish, no stump or wrinkle at bend of fourth vein, tegulae nearly white, halteres tawny.

Length of body, 9.5 mm.; of wing, 8 mm.

Described from one specimen; Ithaca, N. Y. Bred by Professor J. H. Comstock from *Limacodes* sp. Issued May 30.

A female which may belong to this species was also sent me by Professor Comstock; it was collected June 28 by Mr. S. H. Crossman, and differs as follows:

More generally silvery white pollinose;

front one-fourth width of head, of equal width, frontal bristles stronger, two orbital bristles directed strongly forward; third antennal joint not so narrowed, palpi and labella more yellow. Macrochaetae of abdomen more differentiated from the macrochaeta-

like bristles, which latter are very much weaker; claws and pulvilli only a little elongate. Abdomen less conical and nearly as wide as thorax.

Length of body, nearly 7 mm.; of wing, 6 mm.

THE EARLY STAGES OF NERICE BIDENTATA.

BY CAROLINE G. SOULE, BROOKLINE, MASS.

The *egg*, found on the under side of an elm leaf, Aug. 9, 1891, was hemispherical, the flat side being attached to the leaf. It was greenish yellow with a whitish bloom over it, and was very like the egg of *Nadata gibbosa*. It hatched on Aug. 13th.

The *young larva* was $\frac{1}{8}$ inch long, of a deep green color, and with sparse hairs. Head brown, lighter on the median suture. The fifth segment had a dorsal and sub-stigmatal spot of shining brown, and the 11th segment had a dorsal spot of the same color. The feet and props were shining brown in color. Anal props were very slender and were raised when the larva walked. The body, at rest, was arched between the feet and abdominal props, and between the abdominal and anal props.

Aug. 16. *1st moult*. Length $\frac{1}{4}$ inch. Head large, almost round, bilobed, pale olive green with dark green face-lines. Body pale glassy green, darker on the dorsum. The glassy effect was striking. 5th segment had a large brown double tubercle on the dorsum, and a substigmatal, smaller one on each side. The tenth segment had a substigmatal brown patch on each side, and the 11th a brown single tubercle or hump, on the dorsal line. Feet brown. Anal props striped with brown; abdominal props brown. Very short, sparse hairs all over the body. Head very smooth. Body arched when at rest, as before.

Aug. 20. *2nd moult*. $\frac{3}{8}$ inch long. Head much larger than 1st segment, clear green, glassy, with brown face-lines. Body glassy green, translucent, with very few hairs; a

faint white lateral line, and a brown, broken substigmatal line appeared; the brown sub-stigmatal patches on 5th and 10th segments were as before. 5th segment had a large double hump, tipped with brown, 11th had the large single hump as before; 4th and 6th had each a double wart on dorsum. Feet brown and shining. Props pale brown banded with dark brown. Anal props slender. Rested arched as before. Ate the leaf from the edge to the mid-rib at the tip, and rested on the bared mid-rib. Aug. 21. The marks had grown clearer and each segment from 6th to 10th showed a small brown-tipped wart on the dorsal line, and from each wart a white oblique line extended downward and backward, on each side. On the first 3 segments a white sub-dorsal line appeared. The effect of the dorsal line was that of the edge of a serrate leaf.

Aug. 23. *3d moult*. $\frac{1}{2}$ in. long. Head large, round, bilobed, smooth, green with dark face lines. Body green, with a broken, brown substigmatal line edged above with yellow, and a double yellow stigmatal line. First three segments had a double white sub-dorsal line. 4th segment had a double dorsal hump, tipped with brown; 5th, a much larger double hump, yellow green, tipped with brown, the brown extending down the front and back like a dorsal line lifted by the hump! 6th to 10th segments had similar humps, but smaller, like that on 4th. 11th segment had a large single hump with brown tip. From all these humps extended oblique white patches. Feet green with a dark, vertical line. Props pale brown

banded with darker brown. Anal props slender, green with a vertical brown stripe. Anal shield shining green like the head. Spiracles, heretofore unnoticeable, green with a brown line on each side, and from them spread white lines like veins, distinct on the green sides of the larva.

Aug. 27. *4th moult.* 1 inch long. Head large, round, smooth, shining green, with a white line on each side of the median suture, and a black line about halfway between this and the edge of head. This black line was edged with whiter on the outer side. Body green. First three segments had, on each side of dorsum, a wide white longitudinal line, below that a narrower one, below that a broken one. The humps were as before except that on 11th segment, which became double. All the humps were unevenly double, the first point being longer than that behind it, as if the second point grew out of the base of the first. The white patches extended up the sides of the humps, and between these patches the green of the body, on the sides, made oblique lines. Sides and venter green. There was a broken substigmatal line of brown edged above with yellow, extending from head to tips of anal props. Feet green with a vertical dark line. Props. green with a brown bar, this bar being crossed by two darker brown lines.

Aug. 30. The brown of the tips of the humps had almost disappeared, as had the substigmatal line. The principal color was semi-opaque white, through which the deep blue-green of the body appeared in lines here and there,—notably the oblique lines on the sides,—and on the venter.

Sept. 3d. The larva was $1\frac{1}{8}$ inches in length and $\frac{7}{16}$ inch from the venter to the tip of the hump on 5th segment. In the afternoon it grew dull in color, the humps seemed to be retracted, and, the next day, were almost level with the dorsal line, and the larva looked small and moist. It spun a few threads to fasten a leaf to the tin.

Sept. 8th. The pupa appeared. *Pupa* $\frac{1}{4}$ inch long, neither stout nor slender, dark brown with much darker head, thorax, wing-cases, anal point, and bands between the segments. Eye-cases prominent and very smooth. Segments distinctly ridged on the edges, and pitted between these ridges. Anal point long, slender, sharp. The pupa was very active, rolling a foot or more at a time.

MISCELLANEOUS NOTES. — By accident the pages of the last number of *Psyche* were marked April instead of May.

An interesting sketch of protective resemblance as displayed in the animal world was given in February before the Belgian academy by Dr. Felix Plateau, and will be found in its Bulletins, pp. 89-135. Interesting examples among insects are given.

A new classification of the Acaroidea with full details and an enumeration of the genera is given by Dr. Trouessart in the *Revue des sciences naturelles de l'Ouest of Paris* for January, 1892. Five suborders and ten families are recognized and six of the latter are separated into twenty-four subfamilies.

The eighth part of the leisurely *Introduction to entomology* by Kolbe has appeared and contains some interesting summaries. The consideration of the muscles is concluded, and the mechanism and physiology of flight and other movements considered with interesting topical bibliographies. The nervous system is then taken up and its main features and especially the brain discussed, followed again by bibliographies.

The extensive but in no way expensive work upon the families and genera of butterflies begun in 1885 by Schatz and continued after his death in 1887 by Röber has just been completed by the publication of the sixth part. The neuration of nearly five hundred different butterflies, representing almost as many genera and accompanied by some rude details of the structure of the legs, palpi, and

antennae, are depicted on the fifty folio plates, while the text (284 pp.) describes the families, lower groups and genera with a statement of the number of species in each. On the plan laid down the work is well and symmetrically done and will prove exceedingly useful; but the classification is bad, the nomenclature of the parts unfortunate, and in the meagre use made of the early stages the hand of the closet naturalist is seen. Furthermore, the work comes to a stop without considering the Hesperidae, except in a single column in the introductory portion on geographical distribution. Schatz evidently intended to include them but Röber quailed before the task. The work can be obtained through Dr. Staudinger of Dresden. A Genera of Butterflies fairly up to the times is still a desideratum.

An interesting summary of his observations on the visits of insects to flowers is given by Robertson in a couple of papers in the recently issued Transactions of the St. Louis academy of science (vol. 5, nos. 3 and 4). The first treats of the insects ob-

served on Umbelliferae, the second on the other orders from Asclepiadaceae to Scrophulariaceae inclusive. The insects were determined by specialists.

The full details of his experiments on destroying chinch-bugs in the field by the introduction of bugs affected by contagious diseases are published by Chancellor Snow in the first report of the experiment station of the University of Kansas.

Under the title Beobachtungen über mückengallen Dr. Fr. Thomas publishes in the Programme of the Ohrdruf Gymnasium observations on cecidomyian galls on thirty different European plants; twelve cases of wholly new cecidia are given, while of eight others the plant host is new.

Dr. Lintner's seventh report on the insects of New York has just been issued; it forms an abundantly illustrated volume of over two hundred pages, about one half of which is given up to accounts of eleven injurious species of different orders. Two papers read before horticultural societies are included in the appendix.

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PSYCHE.

THE BOMBYCINE GENUS LAGOA, TYPE OF A NEW FAMILY.

BY A. S. PACKARD, PROVIDENCE, R. I.

In its general appearance the larva of *Lagoa* is in some respects intermediate between the *Cochliopodidae* and the *Liparidae*. It resembles the former group in the short thick body; in the head being concealed by the prothoracic hood; and in the venomous spines.

On the other hand it resembles the *Liparidae* in the hairy body, the hairs being finely plumose, a peculiarity of more common occurrence in the *Liparidae* than in the *Cochliopodidae*.

As regards the cocoon this is intermediate in form and texture between that of *Orgyia*, etc., and the *Cochliopodidae*, but it more closely approaches that of the latter; it varies somewhat in density in different species, being usually quite firm and dense, like parchment, nearly as much so as in those of the *Cochliopodidae*, and also approaching them in shape, being oblong-cylindrical, oval, contracted at the anterior end, and with a separately-spun lid, closing the front end. As Dr. Lintner has shown with many interesting details, "The lid is woven by the caterpillar separately from the rest of the cocoon, and is not a section cut from it after its completion." Ent. contr., ii. p. 142.

The pupa is much like that of *Limacodes*, etc., the integument or cast cuticle

being remarkably thin, and after the exit of the moth the antennae and legs, as well as the wings, are free from the body; while the latter is split both down the back and along the under side to the end of the thorax. Moreover when the moth escapes, the pupa-skin is left with the head and thorax projecting out of the end of the cocoon.

As regards its imaginal or adult characters it is also intermediate between the two families mentioned. In the short stout body and short broad wings it has the habit of a *Limacodes* rather than of such *Liparid* genera as *Porthesia*, etc. In the shape of the antennae and palpi it is about as near the *Liparidae* as the *Cochliopodidae*.

In respect to the denuded head, *Lagoa* is much more like *Euclea* than the *Liparidae*. The clypeus is rather long and narrow, similar in shape to that of *Euclea*, though rather narrower, and is thus more like that of the *Cochliopodids* than that of the *Liparidae*, represented by *Orgyia* and the European *Porthesia chrysorrhæa*, whose denuded heads I have examined. The epicranium and occiput taken together (on the median line of the body) are about one third as long as the entire clypeus.

As regards the venation, *Lagoa* is

decidedly nearer *Euclea* and other *Cochliopodids* than the *Liparidae* (I have examined the venation of *Orgyia* and *Parorgyia*). *Lagoa* has the same wide costal region of the fore wings as in *Euclea*, that of the *Liparidae* being very narrow; the five branches of the subcostal vein are thrown off in nearly the same manner as those of *Euclea* and *Limacodes*. The discal veins and origin of the independent (6th subcostal) are almost precisely as in *Euclea*, and the four branches of the median vein are also similar in their mode of origin, and unlike those of *Orgyia* and *Parorgyia*.

In the hind wings, as in the *Cochliopodidae*, there are ten veins, in the *Liparidae* only nine; there are but two branches of the subcostal vein, the third branch being detached, so that there are two independent veins, one arising from the anterior, and the other from the posterior discal vein. In the *Liparidae* mentioned there is no independent vein. The four median veinlets have the same peculiarities in their mode of origin as in *Cochliopodids* and the same differences from the *Liparidae*.

To sum up: in the superficial characters of the imago, and in having abdominal legs in the larva, *Lagoa* resembles the flat, scale-like *Liparidae*, but in all its essential characters, those of the egg, of the larva, pupa, and imago, it belongs with the *Cochliopodidae*, except in the matter of the presence of abdominal legs in the larva. On this account it seems fairly entitled to be regarded as

the type of an independent group. We may regard it as a generalized, ancient group of *Cochliopodidae*, and refer it to a subfamily *Lagoinae*, or we may boldly remove it altogether from either of the two families mentioned and consider the genus as the representative of a distinct family and designate the group by the name of *Lagoidae*. This on the whole seems to us to be perhaps the most judicious course to pursue. At all events the insect is plainly enough an ancient, ancestral, or generalized form. It is a *Cochliopodid* with larval abdominal legs. It lays eggs like those of *Limacodes*, etc.; its head in the larval state is concealed from above by the prothoracic hood; its larval armature is more of the *Cochliopodid* type than *Liparid*; so are the pupal characters and the nature of the cocoon; and the shape of the important parts of the head, and the essential features of the venation, are overwhelmingly *Cochliopodid*. Under these circumstances we feel justified in regarding *Lagoa* as a most interesting ancestral form, and as affording arguments for considering the *Bombyces* as a whole as a generalized and ancestral group, and as epitomizing the other higher lepidopterous families.

The genus is peculiar to North and South America, and may rank with such forms as the colossal sloths, and certain American vertebrate survivors of middle Tertiary times. In some respects it is intermediate between the *Saturniidae*, especially the higher *Attacinae* and the *Cochliopodidae*.

THE LEPTIDAE AND BOMBYLIDAE OF THE WHITE MOUNTAINS.

BY LEWIS E. HOOD, SOMERVILLE, MASS.

But few local lists of the Diptera have been published and until this order has been placed upon a higher basis by monographic study anything seems useful that will contribute to our knowledge of the geographical distribution of this neglected group of insects.

I have considerable material from the mountains of central New Hampshire and a list of the Leptidae and Bombylidae are given below; good series of several other families are in my possession especially in the Tabanidae, Asilidae, Empidae, and Trypetidae which I shall work up as time allows.

What knowledge I have of the dipterous fauna of the White Mt. region has been gained by the study of the insects collected during two trips between the years 1883 and 1887, and from several small lots of flies obtained from friends by exchange; supplementary to these personal collections I have had free access, through the kindness of Dr. H. A. Hagen, to the rich collections of Dr. H. Loew and Baron C. R. Osten Sacken in the Museum of comparative zoölogy in Cambridge, Mass., thereby not only being able to determine my species by direct comparison but becoming familiar with their series of New England Diptera.

There is a marked similarity between the dipterous fauna of the southern portion of the White Mountains,

and that of eastern Massachusetts, but the species obtained north of Mount Washington seem to be more local, with many that are common in Canada; the material from the mountain region is far too incomplete to warrant any definite conclusions as to distribution but I add to the list a few notes that have some bearing on this subject.

At no place did I find the Leptidae numerous, while certain species of Bombylidae were well represented by specimens; many are limited in their distribution with only one or two that could be considered cosmopolitan.

Most of my specimens were collected at North Conway, Bemis, Upper Bartlett, Glen Station, Mt. Washington, and the region around Jefferson.

FAMILY LEPTIDAE.

Triptotricha rufithorax Say. Upper Bartlett; before only recorded from N. Y. westward.

Chrysopila fasciata Say. North Conway, also at Hollis, N. H.

Chrysopila quadrata Say. North Conway, Bemis, N. H., eastern Massachusetts and throughout New England.

Chrysopila thoracica Fab. One specimen from near Mt. Lincoln; I am not certain of exact locality, and have specimens from Massachusetts and Maine.

Leptis hirta Loew. A specimen from the western part of the state

agrees in every respect with Dr. Loew's description but with slight, if it can be called any, facial swelling. Osten Sacken in his Catalogue gives Illinois as the habitat of this species. The present may be a new species but it is best to wait until other specimens are received before any special description is given.

Leptis mystacea Macq. Bemis and Jefferson, N. H., eastern Massachusetts, Norwich, Conn.

Leptis punctipennis Say. North Conway, Nashua. Osten Sacken states that this is common in the northern states, but it has not proved so in my collecting grounds.

Atherix variegata Walk. A single specimen from Jefferson collected in 1883.

FAMILY BOMBYLIDAE.

This family is better represented than the former, especially in the number of specimens. In his Catalogue Baron Osten Sacken gives the White Mountains and Maine as the habitat of *Exoprosopa dorcadion* O. S. in New England; I place the species in this list but as yet I have not received it from New Hampshire.

Exoprosopa dorcadion O. S.

Exoprosopa fascipennis Say. North Conway; and I have it from Connecticut.

Exoprosopa fasciata Macq. Jefferson, Bemis, Nashua; rather rare near Boston, Mass.

Anthrax lateralis Say. Single specimen near Bemis.

Anthrax nigricauda Loew. Jefferson; only a single specimen; have never found it before in New England.

Argyramoeba analis Say. Jefferson, N. H., Massachusetts, New Jersey, and in the collection of Mr. J. A. Wright a specimen labelled "North Carolina" received from Mr. Morrison.

Argyramoeba pluto Wied. "W. Mt"? I have a specimen marked "W. Mt." lately received with other species in exchange; it is possible this means "Western Montana" but I am led to believe that it is from the White Mountains.

Argyramoeba simson Fab. Single specimen from the western foothills of the White Mountains.

Bombylius fratellus Wied. North Conway.

Bombylius pygmaeus Fab. Jefferson.

Bombylius varius Fab. A single specimen much damaged, obtained near North Conway, I take to be this species, but the identification is not positive. Another species of this genus collected near Jefferson is still unidentified; it is closely allied to *B. atriceps* Loew, but much smaller.

Systropus macer Loew. Upper Bartlett.

Epibates fumestus O. S. In his Catalogue of American Diptera Osten Sacken gives the White Mountains as the habitat of this species. I have as yet never seen a specimen, and it is probably very rare.

Some species of this family were very common but it was quite another thing to catch them, they being approached with difficulty, seemingly more active than their brothers in the Bay state.

(Continued from page 274.)

des plantes at Paris, a ♀, and the Philadelphia type of the same at the Oxford museum, and from my notes and sketches taken at the time (1865-66) I can have no doubt that the two species are identical, an opinion first advanced by Burmeister (Germ. Zeitschr. ent., 2, 54) and now generally held. Burmeister's description appeared at least a month before Serville's. That the Brazilian specimen mentioned by Serville belonged to a different species is probable both from its geographical separation and because Serville mentions that the inside of the hind femora is of a deep blue, which might have been taken from the Brazilian specimen but is not true of the North American species.

This is a characteristic species of the southern United States, where it extends everywhere from Florida to Texas, and ranges as far north as Maryland, Pennsylvania (Serville), and New Jersey in the east, Illinois as far north as Union County (Thomas) or Rock Island County (McNeill) where it is rare, and in the west to Nebraska. I have specimens before me from various parts of Florida, Dallas, Tex., Georgia, North Carolina, Virginia, Maryland, New Jersey, and Nebraska.

HIPPISCUS (H.) PANTHERINUS sp. nov.

Pale ochraceous, the head strongly tinged with pale yellow, full and well rounded, only moderately broad above; vertex transversely scabrous behind the scutellum which

is broader than long, with distinct and somewhat elevated, though smoothly rounded bounding walls which rapidly converge on the sides anteriorly, its front terminated by a transverse and deep foveolate sulcus separating its body from the frontal costa; posteriorly the bounding wall is slight and a feeble longitudinal carina passes through its posterior half, the floor nearly smooth; lateral foveolae small, subrhomboid, distinct; frontal costa rather deeply sulcate except at extremities. Antennae fuscous, paler at base. Pronotum not very stout, the posterior lobe less expanded than usual, the median carina impressed rather than cut by the anterior sulcus, and the effect heightened by its partial suppression immediately behind said sulcus and the formation of a slight discal scutellum; surface rugose but not prominently nor densely, the lateral canthi moderately sharp and traversing the principal sulcus; color ochraceous with a pale yellow oblique stripe on either side of the metazona, broad anteriorly and narrow posteriorly, giving the metazona the appearance of a greater expansion than it has. Tegmina dark fuscous with strongly pantherine, transverse, pallid or yellowish stripes which become narrower and fainter in the semipellucid apex; in all cases they are continuous, subequal, and traverse the whole or nearly the whole of the tegmina outside the axillary area which is fuscous except for one or two partial bands adjoining those of the area above but separated from them by the clear pale yellow sutural stripe; an oblique pallid discal stripe follows the descending portion of the ulnar vein connecting the transverse stripes at either end; darker spots of the marginal field blackish fuscous and conspicuous especially in middle of tegmina. Wings pale lemon-yellow at base with a rather broad dark fuscous stripe hardly narrowing in the upper part of the anal field, but narrowing with great regularity to the anal angle which it reaches, leaving four lobes of the margin intact; separated by a

very narrow yellow line from the humeral stripe which runs two-thirds of the way to the base traversed interiorly by conspicuous yellow cross veins; costal margin more or less tinged with orange, the apical portion of axillary area with a few cellular fuliginous spots clustered along the veins. Hind femora uniform coral red within from base to apex, testaceous externally with clouded fuscous oblique stripes, above mostly fuscous; hind tibiae coral red externally, pallid toward base, the spines black tipped.

Length of body, 39 mm.; of tegmina, 37 mm.

Pecos River, Texas, June 18. Capt. Pope, one ♂.

This species not only shows a departure toward the Xanthippus type of structure of the pronotal carina, but it strikingly resembles *H. (X.) conspicuus* Scudd. It differs from the latter, however, in the structure of the head and pronotum, as well as in the width of the arcuate dark band of the wing; and from the Xanthippus type generally in the great depth of the inferior carina of the hind femora. So far as can be seen the antennae are of the Hippiscus type, but the tip is lost in the only specimen known.

HIPPISCUS (H.) HALDEMANII.

Oedipoda haldemaniai Scuddl, Rep. U. S. geol. surv. Nebr., 251; Glov., Ill. N. A. ent., Orth., pl. 13, fig. 3?

Hippiscus haldemanni Scuddl, Bull. U. S. geol. surv. terr., 2, 264.

Oedipoda paradoxa Glov. (not Thomas), Ill. N. A. ent., Orth., pl. 18, fig. 14.

Hippiscus nanus Sauss., Prodr. Oedip., 86-87.

Hippiscus tuberculatus McNeill, Psyche, 6, 63.

Oedipoda neglecta Thom., Key Ill., Orth., 3; Bull. Ill. mus., 1, 64; (not *Oe. neglecta*

Thom., Proc. acad. nat. sc. Phila., 1870, 81-82, etc.

I have re-examined some of the types of this species and base thereupon my conclusions about the synonymy of this and the allied species. That it is the *H. nanus* of Saussure there can, I think, be no question. It is not the *Oe. paradoxa* of Thomas, which an examination of the type shows to be a Xanthippus, though Glover figures quite a different insect. Illinois specimens labelled by Thomas show, strange as it may seem, that it was this insect which he mistook for his *Oe. neglecta*.

This species appears to be confined to the centre of the continent. Passing from east westward, the localities known to me are the following: Moline, Ill. (McNeill), southern Illinois (Thomas), the Red River of the North (Kennicott), middle Kansas (Bruner in litt.), all eastern and middle Nebraska and the Sand Hills of the same state (Bruner in litt.), eastern Nebraska (Dodge), Nebraska City and the banks of the Platte River (Hayden), Garden of the Gods, Colorado (Packard), Colorado (Saussure).

HIPPISCUS (H.) TEXANUS sp. nov.

Brownish fuscous, darker above than on the sides, inconspicuously dotted with black, the head, excepting above, ochraceous more or less mottled with brown, the vertex behind scutellum lightly corrugate, often in the ♂ transversely disposed; scutellum large with slight and not sharp bounding walls, of nearly equal length and breadth (♀) or much longer than broad (♂), its front margin deeply V-shaped and connected more or less faintly at the point of the V with the longi-

tudinal carinae of the vertex; lateral foveolae rather small, subtriangular and shallow; frontal costa somewhat constricted above, gently expanded at the ocellus at and below which it is moderately sulcate. Antennae ochraceous, becoming blackish fuscous in apical half or third, hardly tapering except on apical joints. Pronotum compressed, gently expanding on the metazona, the dorsum very faintly tectiform, and the prozona posteriorly tumid centrally, the surface with distant prominent glistening granulations or very brief vermiculations; median carina simple, moderately pronounced with a distinct but very slight uniform arcuation; lateral canthi not very pronounced, confined to the metazona but for slight indications; posterior margin rectangular; lateral lobes with sparse, feeble, and very brief vermiculations, the centre marked with a fuscous blotch enclosing a yellowish quadrate mark below. Tegmina cinereous and fuscous, the former prevailing in the ♀, the latter in the ♂ where it also becomes blackish and the cinereous of a brighter tone: the marginal field has a large quadrate fuscous spot just beyond the angle of the humeral lobe, and in the ♀ this is almost the only dark marking therein, while in the ♂ it is preceded by one and followed by two similar but a little smaller, equally dark spots, and the apical portion of the field is much infuscated; in both sexes the axillary area is dark cinereous with dark veins and faint fuscous spots; sutural stripe of the lighter color and tolerably conspicuous; the inner discoidal field has rather small and roundish fuscous spots, the largest and roundest just at or within the broadest part, the outermost below the sharply triangular fuscous spot at the extreme base of the outer discoidal field and separated from it by only a narrow cinereous line at the upper edge of the ulnar interspace; beyond this the outer discoidal field has three or four very similar broad transverse fuscous bands, relatively much broader and much darker in the ♂ than in the ♀,

becoming blurred and indistinct apically. Wings coral red at base, the fusco-fuliginous arcuate band marginal below the fourth lobe, of moderate breadth, narrowing but little as it passes to the anal angle, but somewhat as it passes upward to the faint and slender yellowish red line separating it from the humeral stripe which reaches toward but not to the base, and is separated from the margin except apically by the red of the base; apex hyaline, slightly infuscated at the edge in the ♂, the veins and cross veins blackish fuscous. Hind femora yellow apically and blue basally within, thrice traversed by broad black bars; outside fusco-cinereous, indistinctly barred with fuscous in the ♂; hind tibiae yellow with an orange tinge, the spines black tipped.

Length of body, ♂, 32 mm., ♀, 47 mm.; of elytra, ♂, 34 mm., ♀, 45 mm.

Dallas, Texas, Boll, May 1, June 6. Described from 3 ♂, 1 ♀. I have since received a specimen from San Antonio, Texas, collected by Newell (Bruner).

HIPPISCUS (H.) RUGOSUS.

Oedipoda rugosa Scuddl., Bost. journ. nat. hist., 7, 469; Walk., Cat. Derm. salt. Brit. mus., 731; Thom., Rep. U. S. geol. surv. terr., 6, 720-721; Syn. Acrid. N. A., 132-133; Key Ill. Orth., 3; Glov., Ill. N. A. ent., Orth., pl. 12, fig. 8.

Hippiscus rugosus Scuddl., Rep. geol. N. H., 1, 377; Sauss., Prodr. Oedip., 85.

Hippiscus corallipes var. *rugosus* Thom., Rep. ent. Ill., 9, 95, 115-116.

This species, originally described from specimens found in Massachusetts and Maine where it is very rare, has since proved to be wide spread. I have myself seen specimens from Norway, Me. (Smith), eastern Massachusetts (Scudder), Delaware (Ent.

soc. Philad.), Maryland (Uhler), Georgia (Morrison in Henshaw's collection), Illinois (Strumberg in Henshaw's coll.), southern Illinois (Kennicott), Republican Fork, Kansas (Lt. Bryant), Lakin, Kans. (Scudder), West Point, Nebraska, and Glendive, Montana! (Bruner), and from Dallas (Boll), San Antonio (Linsecum), and Bosque Co., Texas (Belgrave). Sausure in addition reports it from Missouri, Thomas from the District of Columbia, Nebraska, and Dakota; and Walker (in whose correct determination of the species I have no confidence) from Nova Scotia, New Jersey, and Vancouver Island. It seems to be a southern species, rarely occurring in the north. Belgrave says that in Texas it is a rare species found on prairies in October.

HIPPISCUS (H.) COMPACTUS sp. nov.

A compact and stout though not very large form. Very dark brownish fuscous, flecked with blackish, the head stout and full, very broad above, olivaceo-fuscous excepting above, where it is brownish fuscous with broad median and lateral longitudinal dull olivaceous stripes; summit of head sparsely punctate, nearly smooth with very slight signs of transverse rugae; vertical scutellum indistinct, with slight and low bounding walls, broader than long in both sexes, faintly quadripartite; lateral foveolae slight, elongate, triangular; frontal costa broad, flat, punctate, slightly depressed at the ocellus, subequal, at upper extremity faintly bifoveolate. Antennae pale cinereous at base, dark fuscous apically. Pronotum stout, but not expanding greatly on the metazona, the dorsal area nearly flat and tolerably uniform

except for the more or less longitudinal glistering rugae which are rather sparse and not very elevated; median carina very uniform and not prominent or arcuate; lateral canthi tolerably well pronounced on the metazona, distinctly and considerably surpassing the median sulcus; angle of posterior margin slightly exceeding a right angle; lateral lobes densely punctate on the metazona. Tegmina cinereous, becoming semipellucid apically, heavily banded with blackish fuscous in tolerably regular transverse subequidistant stripes, with very little obliquity, broader in the proximal than in the distal half of the tegmina; they are subcontinuous in the marginal and discoidal areas, and the axillary area is fuscous with three or four small blackish spots seated on the anal vein; sutural stripe distinct and yellowish cinereous; the spot at extreme base of the outer discoidal area is completely amalgamated with that below and slightly within in the inner discoidal area; the outer stripes are slender, more or less maculate, and do not reach the lower margin of the tegmina. Wings pale lemon-yellow at base with a pretty broad, blackish fuscous, arcuate band scarcely reaching the anal angle and touching the margin only at the 5th (♂) or 6th (♀) lobe; it is not narrowed above, is separated from the humeral stripe by a testaceous line, the stripe reaching nearly to the base; apex hyaline, or in the ♂ slightly infuscated next the margin above, all the veins blackish. Hind femora clay yellow within banded with black, dull cinereo-fuscous without, obliquely banded with blackish fuscous; hind tibiae brownish yellow, more or less infuscated except in a broad band just beyond the base, spines black tipped.

Length of body, ♂, 26 mm., ♀, 33 mm., of tegmina, ♂, 22 mm., ♀, 29 mm.

Carolina, from the Schaum collection; Maryland, from the south shore of the North Potomac. Described from 1 ♂, 1 ♀.

THREE NEW PAMBOLIDS FROM THE UNITED STATES.

BY WM. H. ASHMEAD, WASHINGTON, D. C.

ARRAPHIS Ruthe.

No species of this interesting genus is yet described from North America and nothing is known of the habits of the several described European species.

Two distinct species, captured by myself in Florida while sweeping, and known to me only in the male sex, may be thus distinguished:—

Metanotum coarsely rugose.

Black: head yellowish.

A. americana sp. n.

Metanotum distinctly areolated.

Black; collar yellow; basal two-thirds of abdomen reddish.

A. minuta sp. n.

A. americana sp. n. ♂. Length, 3 mm. Black, shining, with a short, sparse pubescence; head and collar, reddish-yellow; basal three joints of antennae, tegulae, and legs, honey-yellow. Head transverse, rounded off behind the eyes, smooth, impunctured; eyes rounded, prominent. Mesonotum trilobed, the middle lobe somewhat rugulose, carinated at sides posteriorly, the lateral lobes shagreened. Scutellum convex, smooth, shining, with a profound crenate furrow at base. Pleurae rugose. Metathorax coarsely rugose, the angles produced into a long spine; tips of the spines yellowish; there is also a delicate carina extending from the base of each spine forward to the spiracles. Wings hyaline, the stigma and nervures brownish-yellow, the costal edge black, the recurrent nervure interstitial with the transverse cubital. Abdomen oblong-oval, black, much depressed, highly polished, and

composed of but three segments, the first with a deep channel along the sides, bounded by a carina above.

Hab.—Jacksonville, Florida.

Type in Coll. Ashmead.

Described from a single specimen.

A. minuta sp. n. ♂. Length 1.4 mm. Black, shining; collar yellow; basal two-thirds of abdomen reddish, the basal half finely longitudinally striated; rest of the abdomen highly polished. Antennae long, slender, black, the pedicel and first flagellar joint alone yellowish. Thorax faintly shagreened or punctate, the mesonotum trilobed, the middle lobe with a slight impression posteriorly just in front of the scutellum but without a carina at the sides. Scutellum smooth with a faintly crenate fovea at base. Pleurae finely rugose. Metathorax regularly areolated, the angles produced into long yellow spines, the surface of the areas, except the long middle, smooth and shining, the middle area transversely wrinkled. Legs honey-yellow. Wings hyaline, the stigma and nervures pale yellow.

Hab.—Jacksonville, Florida.

Type in Coll. Ashmead.

PAMBOLUS HALIDAY.

P. bifasciatus sp. n. ♂ ♀. Length ♀ 3 mm., ovip. 0.3 mm.; ♂ 2.6 mm. Black, subopaque, minutely shagreened; metathorax finely rugose and indistinctly areolated. Mesonotum without furrows. Scutellum flat with a crenate furrow across the base. Wings hyaline with two transverse, fuscous bands. Antennae in ♂ 21-, in ♀ 22-jointed, pale yellowish-brown. Legs dark fuscous.

almost black, the tarsi pale. Abdomen a little longer than the head and thorax together, longitudinally striate, the apical margins of segments 2, 3, and 4, apical half of 5, and the following segments smooth, polished; the second segment has also two transverse lines or impressions, the first distinct situated a little beyond its basal third, the second indistinct.

Hab. — District of Columbia, Cali-

fornia, and Morgantown, W. Va. Types in Coll. Ashmead and National Museum.

My specimens were taken at large, while those in the National Museum were reared June 24, 1891, at Morgantown, W. Va., by Prof. A. D. Hopkins, from *Anthaxia viridicornis*, living in willow twigs.

NOTES ON CERURA, WITH DESCRIPTIONS OF NEW SPECIES

BY HARRISON G. DYAR, BOSTON, MASS.

The species of *Cerura* have been so badly mixed up in Prof. Smith's new list, that I will give a catalogue of them, as follows:

CERURA MULTISCRIPTA Riley.

1875 — Riley, Trans. St. Louis acad. sci., iii, 241.

1890 — Dyar, Psyche, v, 393.

Habitat — Missouri and Illinois to New York.

CERURA SCITISCRIPTA Walker.

1865 — Walk., Cat. lep. Brit. mus., xxxii, 408.

var. CANDIDA Lintner.

1877 — Lintn., 30th rept. N. Y. State mus., 199.

1891 — Dyar, Can. ent., xxiii, 87. *pr. var.*

Habitat — Georgia to Kansas.

CERURA CINEREA Walker.

1865 — Walk. Cat. lep. Brit. mus., xxxii, 407.

1883 — Edwards and Elliot, Papilio, iii, 130.

1891 — Dyar, Psyche, vi, 80.

var. CINEREOIDES Dyar.

1890 — Dyar, Can. ent., xxii, 253.

1891 — Dyar, Psyche, vi, 82.

Habitat — New York to Montana and California.

CERURA OCCIDENTALIS Lintner.

1877 — Lintn., 30th rept. N. Y. State Mus., 194.

1881 — French, Can. ent., xiii, 144.

Habitat — Pennsylvania to Canada and Wisconsin.

CERURA MODESTA Hudson.

1891 — Hudson, Can. ent., xxiii, 197.

Habitat — Northern New York.

CERURA BOREALIS Boisduval.

1832 — Boisd., Cuv. an. kingd., (Griffith).

1841 — Harris, Rept. ins. Mass., 306.

1864 — Packard, Proc. ent. soc. Phil., iii, 375.

1872 — Lintner, 26th rept. N. Y. st. cab. nat. hist., 151.

1877 — Lintner, 30th rept. N. Y. st. mus., 196.

1881 — French, Can. ent., xiii, 145.

1891 — Dyar, Can. ent., xxiii, 85.

Habitat — Georgia and Missouri to Illinois and New England states.

CERURA SCOLOPENDRINA Boisduval.

1869 — Boisd., Léop. de la Cal., 86.

1891 — Dyar, Can. ent., xxiii, 186.

aquilonaris Lintner.

1877 — Lintn., 30th rept. N. Y. state mus., 197.

1891 — Thaxter, Can., ent., xxiii, 34.

1891 — Dyar, Can. ent., xxiii, 186. *pr. syn.*

Habitat — New York, Canada, Montana, Oregon and California.*

*This is, doubtless, the species to which Butler referred as *C. bicuspis* Bkh. in Ann. mag. n. h., viii, 317.

CERURA ALBICOMA Strecker.

1884 — Strk., Proc. acad. nat. sci. Phil., 284.

Habitat — Colorado.

CERURA PARADOXA Behr.

1885 — Behr, Bull. Cal. acad. sci., i, 64.

Head, thorax and legs clothed with dense white hairs, slightly tinged with cinereous on the collar, and banded on the thorax centrally with black and orange scales; abdomen cinereous, banded with white on the posterior edges of the segments. Fore wings silvery white, the transverse bands usually absent, but not diffused as in *Cerura meridionalis*. When present they are faint, smoky gray, the inner one excavate on the inner side, nearly straight on the outer and slightly incised on the median and internal veins. (The outer is absent on all the specimens before me.) A black dot at base on median vein; just beyond it, another on the subcostal; further out, five more in a curved line, the first extending from costa to costal vein, second on the subcostal vein, third on the median, fourth on internal and fifth on the internal margin. The transverse band is represented by scattered, small gray scales; its margin defined in black on the costa and median vein, and strongly marked with orange scales on the costa, median and internal veins and internal margin. Beyond the band, are five black dots, on the costa, subcostal, median and internal veins respectively, and on the internal margin, the third just at the origin of vein 2. Median space white with a smoky gray transverse line, inwardly produced on the submedian fold. In some specimens this is very faint, but not more so than the other markings. Just beyond it, are two rows of venular dots, representing the outer band and separated by a space of from $\frac{1}{2}$ to 1 mm. The inner row is black, the outer orange, and in one specimen they are the only distinct markings. Terminal space clear white, except a very few inconspicuous small gray scales near costal margin. Terminal intervenular dots distinct, black, but variable in size from small to large.

Hind wings non-lustrous white, with the blackish terminal dots.

Below white, an extra-mesial gray shade line on fore wings and discal spots on both pair. Terminal dots as above.

Expanse, 37-42 mm.

A decidedly variable species, especially in the distinctness of maculation.

Var. PLACIDA, n. var.

This is the form in which the smoky gray transverse bands are evident at first glance, and the characteristic aspect of the species is much modified thereby. The form is rare, occurring only in two or three females out of the large number of specimens in Dr. Behr's collection. It is a partial reversion to the usual type of marking in the genus *Cerura*.

Habitat — Nevada Co., California.

CERURA MERIDIONALIS, n. sp.

Head, collar, and patagia white, thorax centrally mixed with blackish and a few orange scales; abdomen apparently pale gray, banded with whitish, but in poor condition in my specimens. Fore wings silvery white, the usual bands and marks nearly lost, being diffused and scattered into numerous black scales, which cover nearly the whole surface. Basal space white, except for a few dots, composed of three or four clustered scales, one at base and, further out, three more, on costal, median and internal veins respectively, the one on the median vein much further out than the others. The transverse band consists of black scattered irrorations on the white ground, with a few orange scales about the median and internal veins. Its shape can be made out, being deeply excavate both without and within, but not broken. It is about 5 mm. wide on internal margin, a little narrower on costa and only a little over 1 mm. wide in its narrowest part below median vein. Median space white, with sparsely, and irregularly distributed black irrorations. The outer band is represented by scattered black irrorations, which extend to the outer margin, but become more dense near the inner border of the band, which is quite sharply defined in one specimen, being

lined, nearly continuously, with orange scales. It starts on the costa, about 4mm. from apex, runs slightly obliquely inwards to vein 5, then curves sharply outward and turns, running parallel to external margin to its junction with the internal margin, where it becomes obscure. It is outwardly produced on veins 3 and 4. In the other specimen, this line lacks most of the orange scales, and is very obscure, its course being hardly discernible. Terminal intervenular spots very slight, consisting of four or five

very small black scales, not contiguous.

Hind wings white, without silvery luster, the intervenular spots larger than on fore wings, smoky black. Below, the wings are white; terminal dots repeated, enlarged.

Expanse 46 mm. Two ♀♀, El Paso, Texas.

Kindly presented to me by Prof. J. J. Rivers of the University of California.

I have drawn up the following table to separate the species of *Cerura* :—

§ 1. Primaries crossed by about eight angularly undulate black lines.

Secondaries black — *multiscripta* Riley.

Secondaries white.

Lines continuous — *scitisscripta* Walker.

Lines broken — var. *candida* Lintner.

§ 2. Primaries crossed at basal third by a broad gray band, which may be broken or diffuse or even entirely obsolete.

Primaries dark cinereous—*cinerea* Walker.

Primaries pale cinereous.

A row of dots in median space — var. *cinereoides* Dyar.

Three dentate lines in median space.

Band with defined edges and a few orange scales — *occidentalis* Lintner.

Band of uniform tint, and without orange scales — *modesta* Hudson.

Primaries white.

Transverse band indistinct, though perhaps broken.

Six black spots in an ellipse on disk—*borealis* Boisduval.

Indistinct dentate lines on disk.

Band broad — *scolopendrina* Boisduval.

Band narrow or broken — *albicoma* Strecker.

Transverse band faint or obsolete, rarely distinct.

Black markings much reduced, often largely absent, but not diffuse.

Transverse band faint or absent — *paradoxa* Behr.

Transverse band distinct— var. *placida* Dyar.

Black markings very diffuse, irrorate, size large — *meridionalis* Dyar.

PERSONAL NOTES :— American entomologists will be pleased to hear that the mathematical physical faculty of Heidelberg University has conferred the degree of Doctor philosophiae naturalis (honoris causa) upon Baron Charles Robert von Osten Sacken.

Prof. C. H. Tyler Townsend of the New Mexico College of Agriculture at Las Cruces, has started on a field trip by wagon from there to the Grand Cañon of the Colorado, via Flagstaff. Prof. Wooton, of the same College, and two students accompany him, and they expect to be away two months.

They have arranged to meet Prof. Toumey of the University of Arizona, and his party, consisting of men from the Agricultural Department in Washington, who start by wagon from Tucson, at Flagstaff about the first of July. They will then go on to the Grand Cañon together, remaining in company three or four weeks, and returning by way of the eastern boundary of Arizona. The object of both parties is the collection of insects and plants.

Dr. W. J. Holland of Pittsburg sailed for Europe June 29 and during the summer will prosecute some entomological studies in the museums of London and Paris.

BIBLIOGRAPHICAL NOTES. — II.

BY SAMUEL HENSHAW.

BIOLOGIA CENTRALI-AMERICANA. — COLEOPTERA. Vol. I. By Henry Walter Bates.

gen. sp.
Cicindelidae, 1881, pt. 13-14, p. 1-18;
1883, pt. 27, p. 256; 1884, pt. 31,
p. 257-261. 8 85
Carabidae, 1881, pt. 14, p. 19-40; 1882,
pt. 15-19, p. 41-152; 1883, pt. 21-
22, 25, 27, p. 153-255; 1884, pt. 31-
32, 34, p. 261-299. 144 999

Species of the following genera are figured: —

Cicindelidae. — *Cicindela*, 1, 13. *Ctenostoma*, 1. *Odontocheila*, 1, 13. *Oxycheila*, 1. *Oxygonia*, 1. *Pseudoxycheila*, 1. *Tetracha*, 1.

Carabidae. — *Abaris*, 4. *Adrimus*, 4. *Agra*, 12. *Allotriopus*, 4. *Amara*, 4. *Anatrichis*, 3. *Anchomenus*, 4. *Ancistroglossus*, 7. *Anillus*, 6. *Anisodactylus*, 3. *Anisotarsus*, 3. *Apenes*, 7, 8, 13. *Apristus*, 8. *Ardistomis*, 2. *Arthrostictus*, 3. *Aspasicola*, 8. *Aspidoglossa*, 2. *Axinopalpus*, 8. *Barysomus*, 3. *Bembidium*, 6. *Brachinus*, 7. *Calathus*, 4. *Calleida*, 9, 13. *Calophaena*, 6. *Calosoma*, 2. *Carabus*, 13. *Casnonia*, 6, 13. *Catapiesis*, 4. *Catascopus*, 7. *Celia*, 4. *Chlaenius*, 3, 13. *Clivina*, 2. *Clopodes*, 5, 13. *Coptodera*, 7. *Cratocera*, 4. *Cryptobatis*, 8. *Curtonotus*, 4. **Cyr-*

tolaus, 5. *Diaphorus*, 6, 13. *Diploharpus*, 6. *Discoderus*, 3. *Dromius*, 8. *Ega*, 6. **Elliptoleus*, 4. *Euchroa*, 4. *Euproctus*, 8. *Eurycoleus*, 7. *Evarthrus*, 14. *Galerita*, 6, 7. *Gallerucidia*, 9. *Glyptolenus*, 5, 13. *Helluomorpha*, 7. *Hyboptera*, 8. *Hypherpes*, 4. **Ithytolus*, 13. *Lachnophorus*, 6. *Lebia*, 10, 11, 12. *Lehis*, 7. *Leptotrachelus*, 6. *Lia*, 12. *Loricera*, 2. *Loxandrus*, 4, 13. *Loxopeza*, 10. *Menidius*, 8. *Micragra*, 6. **Mioptachys*, 6. *Mizotrechus*, 6. *Morio*, 4. *Moriosomus*, 4. *Nemotarsus*, 7. *Notiobia*, 3, 13. *Notiophilus*, 2. **Ochropisus*, 7. *Omophron*, 2. *Onota*, 8, 13. *Onyptergyia*, 5. *Otoglossa*, 8. *Pachyteles*, 2, 13. *Panagaeus*, 3. *Pasimachus*, 2. *Pelecium*, 3. **Pelmatellus*, 3. *Pentagonica*, 9. **Percolaus*, 4. *Pericompso*, 6, 13. *Perigona*, 6. *Pheropsophus*, 7. *Philopheuga*, 9. *Phloeoxena*, 7. *Physea*, 2. *Pinacodera*, 7, 8. *Platynus*, 4. *Platysoma*, 4. *Polpochila*, 3. *Pseudomorpha*, 12. *Scaphinotus*, 13. *Schi-zogenius*, 2. *Selenophorus*, 3, 13. *Stenocrepis*, 3. *Stenoglossa*, 7. *Stenognathus*, 7. *Stenomorphus*, 3. *Stenous*, 3. *Stolonis*, 4. *Tachys*, 6. *Tachyta*, 6. *Tetragonoderus*, 7. *Trechus*, 6. *Xystosomus*, 6.

New genera are marked (*); the figure following the name of the genus denotes the number of the plate. Of the 85 species of *Cicindelidae* found in Central America 18 species occur in America north of Mexico and of the 999 species of *Carabidae* from Central America 84 are found in America north of Mexico.

CERURA MODESTA. — In my list of the *Bombyces* taken at electric light in Poughkeepsie, N. Y., given not long since in *Psyche*, occurs the name *Cerura aquilonaris*. This I now believe is an error, and the name should be *Cerura modesta* Hudson. This species was not then described, and the determination was made from a single example in very poor condition taken from the lamps previous to 1890. *C. aquilonaris* Lintn. (= *scolopendrina* Boisd.) probably does not occur in New York. — HARRISON G. DYAR.

GENERAL NOTES:—Hudson's Elementary manual of New Zealand entomology, an octavo work of 136 pp. and 21 colored plates, is not at all what its title would lead one to expect. It is rather an account of a selected series of insects of all orders, about 113 species, the life-history or habits of which were more or less known to the author. Perhaps the most interesting and the fullest are those of species of *Hepialus* and *Oeceticus*. Its value consists in this and the figures of the larvae, etc., which are unfortunately rather too vague and generalized for special use. It is, however, an interesting sketch of insect-life at the antipodes.

The third part of Lowne's Anatomy of the blowfly, concluding the first of two volumes, contains 136 pp. and 10 pl. It discusses the topographical anatomy of the muscles and viscera of the imago, the embryology, the general anatomy and histology of the insect, and the development of the nymph in the pupa. The next volume will deal with the internal organs. Many of the author's views are diametrically opposed to those usually received, but in such cases both sides are presented.

The tenth part of Moore's Lepidoptera Indica deals entirely with the Satyrinae, but

contains nothing of general interest.

The Royal Society of New South Wales offers its medal and twenty-five pounds for the best communication on each of several subjects, among which is one "on the injuries occasioned by insect-pests upon introduced trees" in that country. The offer is closed in May, 1893.

Theodore Shaw of Wellesley, Mass., a boy of nine, informs us that on June 14 last he caught a specimen of *Heraclides cresphontes* in that town. It is not known to have been seen in Massachusetts since 1883.

PROCEEDINGS OF SOCIETIES.

CAMBRIDGE ENTOMOLOGICAL CLUB.

8 April, 1892.—The 170th meeting was held at 156 Brattle street, Mr. S. Henshaw in the chair.

Mr. A. P. Morse showed some larvae of *Corethra* which he had recently collected. He also remarked that while collecting lately he had found a salamander which had been feeding on white ants.

Mr. S. H. Scudder read letters from Mr. W. H. Edwards and Mr. J. Fletcher, both noting the poor success they had had in wintering the larvae of several butterflies.

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A JOURNAL OF ENTOMOLOGY.

[Established in 1874.]

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AUGUST, 1892.

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PSYCHE.

SOME OLD CORRESPONDENCE BETWEEN HARRIS, SAY, AND PICKERING.—VI.

[PICKERING TO SAY.]

SALEM, Sept. 9th, 1825.

Dear Sir,

I take the present opportunity to forward you a few specimens of insects. The brown butterfly inhabits the bald summits of the White mountains of New Hampshire and appeared to be confined to those regions. Mr. Nuttall described to me a year ago an insect from the same locality probably identical with this, but unfortunately his specimens were lost. The white *Pieris* occurred not unfrequently about the base of the mountains, together, with a fine species of *Apatura*? with a broad white band across the middle of each wing, of which I was unable to procure more than a single specimen. The small *Lycæna* was taken in a bog meadow in this vicinity. Your *Cicindela formosa* I have frequently met with in this vicinity, and particularly, it occurred in great numbers, for two successive years, at a sandy spot near Cambridge in this state: the other *Cicindela*, of which I have sent you the two extremes in the variation of the markings, is distinguishable at first sight from *C. sexguttata* by the convexity of the elytra and also by the

comparative dullness of the colors when alive, occurred abundantly at the same locality and I have met with it no where else. The *Pollyxenus* I met with two or three times this last spring under the bark of the Walnut; on the side of the White mountains under the bark of a dead pine I took a single specimen of the genus *Craspedosoma* which I have by me now though it is very much injured. The black *Lepidura* is also from the sides of the White mountains. The *Tipula* is found in ditches in bog meadows in this vicinity and makes a curious appearance when flying, the six legs are then extended and become very conspicuous, slowly moving along, while the means by which the motion is produced are not seen. I have filled up the box with duplicates from my collection (which unfortunately are rather scarce particularly of the more uncommon species) of the genera *Leucopsis*, *Plebejus*, *Leach*, *Xylota*?, *Syrphus*, *Nemotelus*, *Stomoxys*, *Hydrometra*, *Curculio*, *Luperus*, *Clytus*, *Cychrus*, &c; if among these you find anything interesting I shall be able to give you further information.

Yours, with respect,

CHARLES PICKERING.

[DRAFT OF REPLY BY THOMAS SAY.]

October 12th, 1825.

I thank you much for the specimens of ins. you were so good as to send me, as well as for the agreeable letter which accompanied them; in the care of Mr. Robinson they all arrived in excellent order.

The *Pollyxenus* you met w. is ["perhaps" erased] the *P. fasciculatus* Nob. if so the species has a wide range.

Pieris, I have not met w. this sp. before & do not know it, have you both sexes?

Limenitis arthemis, Drury, the Butterfly w. a broad white band across ea. wing.

Lycaena phlaeas, var.

Cicindela formosa. I am surprised to learn that this is f'd in y'r region; I've never met w. it here. I think you will find the green *Cicindela* to be a variety of *C. 6-guttata*, I have some

specimens on which the punctures are very large so as to give the surface a very rough appearance.

The *Craspedosoma* must be interesting, I have not yet found a sp'n in this country.

The black *Leptura* is my *L. pubera*.

"The *Tipula* found in ditches &c" is *Ptychoptera clavipes* of authors.

The brown butterfly is my *Hipparchia semidea*. I received a mutilated specimen from Mr. Nuttall, but yours is in good order. I propose to figure it in my 3rd or 4th vol. (the marbling of the under sides of hind wing is much as in *H. semele*, but the dark lines are broader.)

The *Leucospis* is a small sp'n of my *L. affinis*.

The Prince of Musignano will deliver you this letter if he goes so far as Salem, if not he will put it in the Boston post office.

Melandrya labiata Nob.

DESCRIPTIONS OF OESTRID LARVAE TAKEN FROM THE JACK RABBIT AND COTTON-TAIL.

BY C. H. TYLER TOWNSEND, LAS CRUCES, N. MEX.

Our jack-rabbits and cotton-tails are frequently badly infested with bots, but the former are usually the worse infested. The jack-rabbit of this region is the *Lepus callotis* of Wagler; while, if I am not mistaken, our cotton-tail is the sage hare, *Lepus artemisia* of Bachman (or possibly *L. bachmani* Waterh.)

Jack-rabbits are sometimes seen with immense, unshapely lumps on their shoulders, sides or backs. Whether or not these are due to bots, I can not

say positively, as I never succeeded in securing a rabbit in this condition. I have been told that when these lumps are cut open, they reveal simply a collection of sacs filled with a watery substance, but without bots.

It may seem strange to record that the jack-rabbit bot is a *Dermatobia*, while the bot of the cotton-tail is, as a rule a *Cuterebra*. Such, however, is the case. While I have not observed any instance as yet of the *Cuterebra* in-

festing the jack-rabbit, I have on several occasions taken small *Dermatobia* larvae from cotton-tails.

On October 10, 1891, nine cotton-tails were shot at Joblin's ranch, in the San Andres Mts. Seven bots were taken from beneath the skins of these. Two, and even three, were found in the same cyst or "warble." Each cyst communicated with the outside by an orifice through the skin. The bots were found on the back, belly and shoulders. They are more shortened in form than those taken from the jack-rabbit, and become of a brown instead of a gray tinge after immersion for some time in alcohol. The following is a description of them:

Larva of Cuterebra sp. from Lepus artemisia (?)—Elongate oval, thick, broader behind than in front, dorsal surface convex in profile, ventral rather concave; first and eleventh segments appearing nearly equal in width when the latter is extruded, but the eleventh appears smaller when sunken; segments gradually increasing in width from first to seventh, the seventh segment widest, remaining segments decreasing in width posteriorly; tenth segment telescopic, sometimes protruded when the eleventh becomes more clearly outlined. All the segments, except the first and eleventh, densely and equally covered, both above and below, with short horny spurs, not spiny, the first segment less bare than the eleventh. One pair of small, straight, approximated black jaws; antennae rather removed basally, approximated distally meeting the jaws, each antenna with two small ocellus-like dots on upper surface; in one specimen the antennae are horny and black so that the dots do not show; jaws and antennae sunk in a crescent-like or semicircular transverse cavity in the first or

cephalic segment, the first segment with a median notch in its upper anterior margin. Anterior (or superior) stigmal plate of last segment sub-circular, more or less completely bifid longitudinally, situated in an a crescentic transverse furrow or cavity, the furrow appearing long crescentic when the tenth segment is extruded, but short and hardly crescentic when not extruded; posterior (or inferior) plate situated in an elongate transverse pit, the margin of the segment below pit bearing a median notch and a slight lateral one on each side. Length, 18 to 20 mm.; width of 7th segment, 9 to 9.75 mm. Described from two specimens collected Oct. 10. San Andres Mts., New Mexico.

On October 10, a jack-rabbit was shot near Joblin's ranch, San Andres Mts., from beneath the skin of which six bots were taken, mostly on the back and about the root of the tail. They are rather elongate, and whitish. Each one lay in its cyst or "warble." The following is a description of them:

Larva of Dermatobia sp. from Lepus callotis.—Elongate conical anteriorly, tapering posteriorly, not stout and thick, broader in front than behind, dorsal surface convex in profile, ventral concave; first segment small, much smaller than eleventh; segments gradually increasing in width from first to sixth, the sixth segment widest, remaining segments decreasing in width posteriorly; eleventh strongly extruded, joining the tenth by a constricted neck, more or less spherical, rather truncate posteriorly. Segments after the first sparsely covered with short black curved spines, showing most plainly recurvate on last segment, which is nearly or quite bare on posterior surface. One pair of very small, rather removed, straight black jaws, situated in a crescentic transverse slit; antennae approximated, ocellus-like dots not visible, a pit in the first segment above and behind the antennae. Stigmal plates

on last segment consisting of four horny, reddish-brown, more or less curved, transversely corrugated ridges on each side, a small pit just above and between them; a swelling or prominence below them which is bounded inferiorly by a crescentic transverse furrow, the margin of the segment below furrow being more or less strongly notched. Length, 19 to 22 mm.; width of 6th segment, 5 to 6.5 mm. Described from five specimens perhaps not fully grown, collected Oct. 10, San Andres Mts., New Mexico.

DOHRN AND BURMEISTER.

Two Nestors of entomology have recently passed away within two days of each other, born in the first and dying in the last decade of the century. Dr. C. A. Dohrn was born in 1806 and Dr. Hermann Burmeister in 1807; the former died May 4, the latter May 2 last. Dohrn was especially known as a coleopterist and as the head and front of the Entomological society of Stettin, Germany. Burmeister occupied many fields, not only in entomology, but in general zoology, in geology and especially in paleontology during the past 30 years, since his appointment to the directorship of the National museum of Buenos Aires. He was buried at the cost of the state and the President of the republic was present at his funeral. Dr. Carlos Berg another entomologist of distinction, long his assistant, succeeds him as director of the museum.

PROCEEDINGS OF SOCIETIES.

CAMBRIDGE ENTOMOLOGICAL CLUB.

13 May, 1892. -- The 171st meeting was held at 156 Brattle St. Mr. S. H. Scudder was chosen chairman and Mr. A. P. Morse secretary pro tempore.

Mr. A. B. Mayer was elected to active membership.

Mr. S. H. Scudder called attention to a short discussion by Emery in the February Bulletin of the Société Vaudoise (v. 27, p. 258) on the origin of the ant fauna of Europe,

This bot must occasionally continue all winter in the animals, as small ones, apparently this species, were taken from cotton-tails shot Oct 24 and 29.

On Oct. 14, a jack-rabbit was shot which had a small sac beneath the skin, apparently containing young bots. Closer examination revealed only *remains* of small bots, which had died from some cause.

a result of his studies of the ants found in Sicilian amber as compared with those of the amber of Samland and the existing fauna of Europe. The existing fauna he divides into three groups, a boreal, an Indian (those having Indo-Australian and South African affinities), and a cosmopolitan, and remarks regarding the first two that in passing from the north southward or from the present time to the amber epoch, the boreal group diminishes and the Indian group increases in importance; the former is absent from the Sicilian amber and the latter in the existing Scandinavian fauna. He is of the opinion that an Indian fauna inhabited Europe in eocene time and that a new fauna, derived from the polar regions, advanced upon it, but was checked in its southward march by the sea which then crossed middle Europe, so that it never reached so far as Sicily although it left its impress on the fauna of the Baltic amber.

Mr. Morse exhibited a specimen of that rarity, the male of *Pelecinus polycerator*, taken by him at Provincetown, Mass., in September. He also showed two males of *Colias interior* collected at the summit of Kearsarge Mountain, near North Conway, N. H., July 2, 1891, and several specimens of *Colias philodice* showing variations in the discal spot on the upper surface of the fore wings; these, in one male, were almost entirely absent, and, in a white female, very large and triangular with the apex and longest sides directed outward.

(Continued from page 288.)

HIPPISCUS (H.) VARIEGATUS sp. nov.

Similar in form and color to *H. compactus* but with the disk of the prothorax generally rather lighter and more often marked by a pallid decussate stripe, which is here found even in the ♀; sculpture of the head not differing from that species, excepting that the ridges about the foveolae are if anything duller and that the frontal costa is slightly sulcate below the ocellus. Antennae luteous at base, beyond reddish fuscous. Pronotum as in *H. compactus* but with the hind margin more obtusely angled, and the carina of the prozona independently though feebly arcuate. Tegmina cinereous or hoary, becoming semipellucid apically, with markings much as in *H. compactus*, but less regular, more maculate, more oblique, the central spot usually very broad, the marginal field much more numerous spotted, and the spots of the axillary area generally more distinct, being deeper and more sharply defined; the tegmina are relatively longer. Wings also relatively longer and narrower, but with markings precisely as in the preceding species, excepting that the basal color is variable (as indeed it may be there), varying from a pallid tint through pale lemon yellow to saffron and coral red, the last in a single example. Hind femora bright yellow within, thrice heavily banded transversely with black, dull clay yellow without, very obliquely banded with blackish or fuscous; hind tibiae yellow with an orange tinge sometimes infuscated a little just beyond a broad clear basal belt; spines black tipped.

Length of body, ♂, 28 mm., ♀, 37 mm.; of tegmina, ♂, 28 mm., ♀, 35.5 mm.

I have seen specimens from Pennsylvania (Schaum coll.), Maryland

(Uhler, Bruner), Washington, D. C. (Bruner), and Georgia (Morrison), in the east, and Indiana (H. Edwards), southern Illinois (Kennicott), and Topeka, Kansas, collected by Cragin (Bruner), in the west. Mr. Bruner also tells me that he has specimens from Virginia, Decatur, Ala., Chattanooga, Tenn., and Mississippi, in the south, and from Indiana, Illinois, Missouri, Kansas, and eastern Nebraska, in the north.

Described from 13 ♂, 8 ♀, part of them from Mr. Henshaw's collection.

HIPPISCUS (H.) SUTURALIS sp. nov.

Hippiscus rugosus McNeill!, Psyche, 6, 63.

One of the smallest species of the genus, with somewhat compressed body, expanding but slightly on the metazona, of the same tone of color and general appearance as the three preceding species. Head dusky above, obscure olivaceous below, the summit nearly smooth with a nearly circular, very shallow and smooth, feebly quadripartite scutellum; lateral foveolae small, shallow, triangular, a little elongated; frontal costa feebly convex but depressed at and immediately below the ocellus, at its upper extremity very feebly bifoveolate. Antennae dull testaceous at base, blackish fuscous apically. Pronotum much as in *H. compactus*, but the angle of the posterior margin distinctly obtuse. Tegmina with the darker blackish fuscous markings predominating on the basal half, so that before the great central quadrate dark spot which includes the triangular base of the outer discoidal area, there are but two pairs of small quadrate cinereous spots beneath each other in the marginal and inner discoidal fields; the apical portion of the marginal field is blackish fuscous and in the

outer discoidal field, the base of which is mostly pellucid, there is a single slender, transverse belt of fuscous above the apex of the ulnar fork and beyond it scattered fuscous cellular spots; the axillary area is wholly blackish fuscous, and the sutural stripe yellow, bright, distinct, and not very narrow. Wings pallid at base with a very broad blackish fuscous arcuate band which strikes the margin below the third lobe and narrows slowly toward the anal angle which it scarcely reaches; above it does not narrow and is separated from the humeral stripe, which runs only half way to the base, by a slender pallid line; apically the wing is pellucid, but in the male a little clouded at the margin and with blackish cross veins. Hind femora pale yellow within, the base and two broad transverse stripes black, dirty yellow externally with oblique black stripes on the upper half; hind tibiae pale dull yellow with a dull orange tinge apically, more or less infuscated on the middle of the outer side, the tips of the spines black.

Length of body, 27 mm.; of elytra, 26 mm.

Moline, Ill., J. McNeill. Described from 1 ♂. It bears a striking resemblance to *H. (X.) neglectus*, but is not the species mistaken for that form by Thomas.

HIPPISCUS (H.) OCELOTE.

Oedipoda (Hippiscus) ocelote Sauss., Rev. mag. zool., 1861, 398-399; Orth. nova Amer., 2, 29-30.

Hippiscus ocelote Thom., Syn. Acrid. N. A., 200-201; Sauss., Prodr. Oedip., 84-85; Addit. prodr. Oedip., 26-27.

This Mexican species is unknown to me, but from Saussure's excellent description and tables evidently belongs in the series near where I have placed it.

It is found, according to Saussure, both in the warmer and cooler zones at Cordova and Guanajuato.

HIPPISCUS (H.) SAUSSUREI.

Oedipoda haldemanni Thom., Rep. U. S. geol. surv. terr., 5, 456; 6, 720-721.

Oedipoda haldemanni Thom., Syn. Acrid. N. A., 130-132.

Hippiscus haldemanni Sauss., Prodr. Oedip., 85-86.

Not *Oedipoda haldemanni* Scudd.

Considering the insufficiency of my description of *Oe. haldemanni* it is not surprising that both Thomas and de Saussure should have mistaken another species for it; having still the types of that species in my possession, I am able to determine accurately what it is. In the present species the pantherine markings of the tegmina are much obscured (though still evident) by the great irregularity of the margins of the fuscous spots and their general blurring.

All of my specimens of the present species come from Texas, from Dallas and San Antonio. Specimens in the collection of Mr. Samuel Henshaw are also from Texas, collected by Schaupp. Bruner sends me specimens from San Antonio, Tex., collected by Newell, and Saussure's specimens come also from Texas; but Thomas, besides Texas, gives New Mexico, Kansas, Nebraska, Colorado, Wyoming, and Dakota; very likely he has confounded other species with this, and that its true home is in and about Texas only.

HIPPISCUS (H.) TUBERCULATUS.

Acridium tuberculatum Pal. de Beauv.,
Ins., 145, pl. 4, fig. 1.

Hippiscus tuberculatus Sauss., Prodr.
Oedip., 87-88; Addit. prodr. Oedip., 27.

Locusta apiculata Say, Mss.; Harr!, Cat.
ins. Mass., 56.

Oedipoda obliterated Germ!, Burm., Handb.
ent., 2, 643.

Locusta corallina Harr!, Rep. ins. inj.
veg., 3d ed., 176.

Oedipoda phoenicoptera Scudd!, Bost.
journ. nat. hist., 7, 468-469; Walk., Cat.
Derm. salt. Brit. mus., 730; Thom., Rep.
U. S. geol. surv. terr., 6, 720; Syn. Acrid.
N. A., 135-136; Key Ill. Orth., 3; Rep. U. S.
surv. 100th mer., 5, 879; Glov., Ill. N. A.
ent., Orth., pl. 5, fig. 4.

Hippiscus phoenicopterus Scudd!, Rep.
geol. N. Hampsh., 1, 377; Rep. Brit. N. A.
bound. comm., 344; Thom., Bull. Ill. mus.,
i, 66; Bull. U. S. geol. surv. terr., 4, 483;
Rep. ent. Ill., 9, 95, 117, fig. 18.

Oedipoda pulchripennis Blanch!, Mss.

Not *Oedipoda phoenicoptera* Germ.

I have seen the type of *Oe. obliterated* in the Halle Museum or what may be regarded as the same, a ♂ from South Carolina, Zimmermann, labelled "obliterated" in Burmeister's handwriting. I have also seen in the Jardin des Plantes a specimen marked as Blanchard's *Oe. pulchripennis* Ms. As stated above, under *H. phoenicopterus*, I have also seen the type of that species at the Halle Museum, and have been able to correct my former error regarding this species. A pair of specimens of *H. tuberculatus* together with one of a distinct genus were seen by me in the Hunterian Museum at Glasgow marked

Gr. obscurus Fabr. which is *Dissosteira saucia*, an Old World species.

This is a northern species, common in the spring in all the northern states and throughout Canada as far north as the arctic region. I have seen many specimens from the upper McKenzie, and Great Slave Lake, collected by Kennicott, and others collected by Richardson's party are in the British Museum which also reports it from Hudson Bay. North of our boundaries it is found from Nova Scotia (Jones) on the east to the Red River of the North (Scudder, Dawson), and Calgary, Alberta (Bean in Henshaw's collection), and in our own country occurs as far west as Dakota and Montana (Thomas) the Big Horn Mountains and Ft. McKinney in Wyoming and the Black Hills of S. Dakota (Bruner in litt.), and is stated to be found on the west coast of North America by Walker; if so, this is probably north of our boundary. In the United States it is found in the east as far south as the middle states,—Pennsylvania, New Jersey, and the District of Columbia (Walker, Osten Sacken, Bruner, Coll. Am. ent. soc.) in some abundance, and is reported also from South Carolina (Zimmermann) and Florida (Saussure, Walker), where it must be rare; and in the west, in Missouri and at Topeka, Kansas (Bruner in litt.), in Nebraska (Thomas), Lincoln, all eastern Nebraska and Holt County and other parts of the Sand Hill region north of Platte River, Nebr. (Bruner in litt.), Missouri (Saussure, Austin), and Colorado

(Thomas), while Walker reports a specimen, perhaps by error, from Oajaca, Mexico.

There is much variety in the markings of this species, so that I have been inclined at times to separate several distinct forms. Specimens from Nepigon, north of Lake Superior, for instance, are very dark, while those from Nebraska not only have the outer half or even more of the tegmina hoary pallid, seen to a certain extent also in some but not all specimens from Manitoba, but the pale vitta which separates the humeral and axillary areas of the hind wings involves not only the anal vein but also, at least in the outer half of the wing, the posterior ulnar vein and the attinent cross veins as well, considerably broadening the vitta. The arcuate dark band of the wings is of variable width; usually broad and involving the posterior margin, it sometimes is very narrow and in both cases may not reach the posterior margin, and in one ♀ from Manitoba there is no trace of a band on the anal area but only a nearly uniform infuscation of the wing beyond the colored base. The depth and extent of the darker markings of the tegmina, as well as the amount of contrast with the paler portions are also extremely variable, giving these organs a very different appearance in different individuals; but in no case do they strongly resemble any other species, so that this species may readily be distinguished from them in the almost total, usually total, absence of any maculation

in the ulnar area of the tegmina, or indeed often of the basal discoidal field. Specimens from east of Long. 90°, too, usually have the extreme tips of the wings distinctly and deeply infuscated, especially in the ♂, and those west of it scarcely ever show any sign of it, but exceptional instances occur.

I append a description of the colors of living females taken in Massachusetts:—

Prevailing color a light ashy plumbeous, slightly darker above, specked with dark plumbeous, tinged slightly beneath with reddish. Head uniform; mouth parts uniform and tinted like under surface of body. Eyes dark brown, specked with yellowish and with a narrow slightly curved transverse median streak of yellowish brown, turning upward posteriorly. Antennae dirty yellowish at the base, beyond of the color of the head. Pronotum with a longitudinal dark brown streak with indistinct edges along the middle of the lateral lobes, and from the middle of this a descending vertical streak scarcely paler than the ground; posterior edge of pronotum a yellowish brown of the color of box wood. Tegmina of the body color blotched with fuscous and black, and with the axillary fold yellowish brown. Wings coral red at base, the arcuate band fuscous deepening to black, the humeral line pale yellow and the apex nearly hyaline. Legs of the body color, the inside of the hind femora having the basal half a prussian blue, the distal half very dull lemon yellow with a transverse streak of deep blue at one third the distance from the middle; hind tibiae dull lemon yellow, hind tarsi tinged with reddish. Abdomen above tinged on the first three segments with reddish brown, especially toward apex; ovipositor of the color of the body when not black.

THE NORTH AMERICAN JASSIDAE ALLIED TO THAMNOTETTIX.

BY E. P. VAN DUZEE, BUFFALO, N. Y.

No attempt has yet been made accurately to place the North American species of Jassidae allied to *Thamnotettix* and *Athysanus*. In the present paper I propose to do this for the more common of our described forms.

The English and continental entomologists by no means agree in their use of such generic terms as *Cicadula*, *Thamnotettix*, *Limotettix* and *Athysanus*, but Fieber's system, adopted by Puton, is most widely used on the continent. This restricts *Cicadula* to those species in which the outer branch of the first sector of the elytra is obsolete or nearly so, thus leaving two antapical areoles instead of three, as in *Thamnotettix*. The old rule of placing the first species described under the older genera as their type is thus disregarded here, but it seems to me justifiably so, as Zetterstedt's first species of *Cicadula* (*quadrinotata*) properly belongs to his preceding genus, *Thamnotettix*.

As stated by Mr. C. W. Woodworth (*Psyche*, v. 5, p. 75, 1888) Sahlberg in his "*Cicadariae*" (1871), unwarrantably places *Cicadula* in the *Typhlocybini*, substituting it for Fieber's genus *Kybos*. Then he erected his genus *Limotettix* (not *Limnotettix* as erroneously written by Mr. Woodworth), and placed in it a selection from several of the genera as arranged by Fieber, among

which may be found most of the species of *Cicadula* as listed in M. Puton's latest catalogue.

We cannot accept Mr. James Edwards' disposition of these genera as published in his "*Synopsis of the British Homoptera*," nor Mr. Woodworth's limitation of the genus *Cicadula* without discarding our present artificial arrangement of this group of the Jassidae for one still more artificial.

Probably most of the genera mentioned below, viz., *Cicadula*, *Limotettix*, *Chlorotettix*, *Thamnotettix*, *Eutettix* and *Athysanus* might be considered as subgenera of but one, or possibly two, generic groups represented by *Thamnotettix* and *Athysanus*. They are certainly unsatisfactory in their characters and quite artificial, as M. Lethierry says of *Cicadula*, "*Nous croyons devoir accepter le genre non comme un genre naturel . . . mais comme un genre artificiel, destiné à faciliter la connaissance et l'étude des espèces.*" But where large groups of species are as poor in structural characters as are the Jassidae we must form our genera so as to lighten the labor of the student as much as possible.

Cicadula as above restricted includes in our fauna three described species, *sexnotata*, *variata* and *punctifrons* of Fallen, all common to Europe and America, and a few forms still unde-

scribed. Here the head is broad and rounded before, as in *Limotettix*, the front is rather narrow, the sides of the pronotum are of moderate length and without a carina, and the elytra are long with a well developed appendix.

In *Thamnotettix*, as here accepted, the head is broad, obtusely angled or rounded before, front narrow, sides of pronotum rather long and carinated; outer branch of the first sector of the elytra evident; appendix well developed. In the twelve following species the sides of the pronotum are of moderate length, with a slender carina more or less distinct and a little oblique, being a little depressed anteriorly to the outer corner of the eye: *clitellarius* Say, *eburatus* V. D., **montanus* V. D., *belli* Uhl., **semipullatus* V. D., *flavocapitatus* V. D., **gilletti* V. D., *geminatus* V. D., *fasciaticollis* Stål, *melanogaster* Prov., *kennicotti* Uhl., *coquelletti* V. D.

In a few species the sides of the pronotum are shorter, sometimes much shorter, with the carina obsolete or nearly so. Here belong: *fitchii* V. D., *atropunctatus* V. D., **smithi* V. D., *decipiens* Prov., *laetus* Uhl., **longiset* V. D.

Th. subaeneus V. D. has the sides of the pronotum quite strongly carinated, and will be noticed below under *Eutettix*.

In another group of allied species the head is still broader, well rounded before and of almost equal length across its whole width, thus recalling *Idio-*

cerus; the ocelli are plainly visible from above; the front is wide as in *Limotettix*, sides of the pronotum of moderate length and distinctly carinated; elytra long, with the appendix well developed, thin and subhyaline in texture, with the nervures indistinct. This genus, for which I propose the name *CHLOROTETTIX*, includes insects larger than we find in the other groups here noticed, of a uniform green color of some shade, occasionally tinged with fulvous or marked with black on the tergum. *Bythoscopus unicolor* Fitch may be taken as the type with which may be placed *Bythoscopus tergatus* Fitch and the *C. viridius* and *C. galbanatus* described below, and also two or three species as yet undescribed. Dr. Fitch's two species have been placed by Mr. Uhler in *Grypotes*, but they want the incurved clypeus characteristic of that genus, and in nervation they approach *Thamnotettix* and *Limotettix*, between which they may be placed.

Limotettix I have used for a group of which three North American species are known to me: *striola* Fall., *parallelus* V. D. and *Cicadula exitiosa* Uhl. The first of these, *striola*, seems to have been intended by Sahlberg as the type of his genus, *parallelus* is closely allied to *striola*, but the position of *exitiosa* is doubtful, and it may not belong here at all. These agree in form very nearly with *Chlorotettix*, but the sides of the pronotum are short and terete and the insects are smaller, more slender, and with more pigmentation.

* The description of these species will soon appear.

Another group, for which I propose the name *EUTETTIX*, is intermediate in its characters between *Thamnotettix* and *Athysanus*. In form the species resemble *Phlepsius*, being broader and stouter than in *Thamnotettix*. The vertex is rounded anteriorly, and more of less transversely impressed behind the apex; the front is nearly as wide as in *Athysanus*; the elytra are proportionately shorter than in *Thamnotettix*, and moderately valvated at the apex, with but one transverse nervure between the first and second sectors. The sides of the pronotum are shorter than in *Thamnotettix* and *ecarinata*.

The type of this genus is *Thamnotettix lurida* V. D. (Can. ent., v. 22, p. 250, 1890.) *Jassus seminudus* Say and *J. jucundus* Uhl. seem to belong here, but the latter has the head more produced and tumid without the transverse impression on the vertex. All these species recall the genus *Phlepsius* very strongly, but there the sides of the pronotum are always carinated and the elytral areoles are more distinctly inscribed with brown pigment lines.

Thamnotettix subaenea Van Duzee bears a decided resemblance to *lurida*, but the sides of the pronotum are strongly carinated and the elytral characters are those of *Thamnotettix*, in which genus it should undoubtedly be retained notwithstanding the difference in the form of the vertex and its general resemblance to *lurida*.

In the genus *Athysanus* I have placed the species ageing with *obsoletus* Kirschb., which I have considered our

most typical species. In these the head is about as wide as the pronotum, but moderately produced before with the anterior edge rounded and the apex obtuse. Elytra broad scarcely longer than the abdomen, or more frequently shorter, broad and usually truncated at apex, the apical areoles short and the appendix narrow or wanting; first sector connected with the second by but one transverse nervure; sides of the pronotum short, but feebly carinated. Here belong *obsoletus* Kirschb., *plutonius* Uhl. and *comma* V. D. of our fauna. The following species are smaller, with the head more produced and conical, the sides of the pronotum longer and without a carina: *curtisii* Fitch, *bicolor* V. D. and *obtus* V. D.

Near *Athysanus* comes a form widely distributed in this country, with narrow, pointed elytra for which I have established the following genus:

ACINOPTERUS n. g.

General appearance of *Allygus*, but with the elytra strongly narrowed posteriorly, and the tip acute.

Head narrower than the pronotum, rounded, or somewhat produced before, with the apex subacute, hind edge broadly concave. Vertex rather short, sloping, convex or more or less impressed behind the apex, surface punctured, the anterior submargin obscurely transversely rugose, passage to the front rounded. Front rather broad, at the base slightly encroaching upon the apex of the vertex, suddenly narrowed at tip. Clypeus much widened apically. Loræ large. Cheeks wide. Pronotum broad and rather short, anterior edge broadly arcuate, posterior nearly straight; sides long, oblique, cari-

nated; lateral angles prominent, latero-posterior rounded. Scutellum rather small. Elytra narrow, lanceolate at apex, the tip acute, appendix wanting; sutural edge straight to the extreme tip; costal and apical margins continuous; apical areoles five, inner small, oblique, second largest, reaching the extreme tip; third and fourth small; fifth, or stigmal, long and usually crossed by one or two transverse veinlets; first and second sectors united by but one transverse nervure, but there are usually three or four connecting the outer claval nervure with the claval suture; all the nervures strong; costa feebly convex. Supernumerary cell of the wings present. Otherwise as in *Athyeanus* and *Allygus*.

ACINOPTERUS ACUMINATUS n. sp.

Fulvous-brown tinged with dull green or yellowish, elytral nervures pale, brown-margined, Length 5-6½ mm.

Head pale. Front with about eight brown arcs, more or less distinct. Pronotum feebly calloused on the anterior margin, with a few shallow impressions arranged parallel to the edge, more obvious in the males; lateral margin as long as the latero-posterior, acutely carinated; disc posteriorly obscurely wrinkled. Basal angles of the scutellum with a brownish triangular spot more or less apparent. Pectoral pieces usually more or less invaded with blackish, sometimes pale and immaculate. Legs pale, or suffused with sanguineous. Abdomen pale, frequently black above, excepting the broad lateral margins; infuscated on the basal and apical segments of the venter in the females; slightly suffused with a pale median line in the males. Elytra pale fulvous, frequently whitish hyaline on the disc of the costal and some of the discal areoles of the corium, and on the inner margin of the clavus, the extreme apex clouded with smoky or even blackish; nervures pale, edged with brownish, the marginal with a fuscous interruption at tip; claval suture brown. Wings smoky,

iridescent, nervures fuscous. Genitalia: Male: Valve wanting. Plates long and narrow, a little longer than the last ventral segment, about one-third wider at base than at their obtusely lanceolate, divergent tips. Pygofer twice the length of the plates, narrowed and obtusely pointed at apex armed beyond the plates with numerous stout spines. Female: Last ventral segment rather long, hind edge with a shallow median notch, either side of which is a broadly rounded lobe, retreating at the outer angles. Pygofer rather broad, their subacute apex moderately exceeded by the oviduct.

Described from 5 ♂, 3 ♀. Maryland, Sept. 29th and Aug. 4th on pines (Uhler). N. Carolina (Osborn). New Jersey (Uhler). Mountains of N. W. Colorado (Gillette). California (Coquillett).

In a male from California the lower surface of the femora are black. A female from N. Carolina has the disc of the elytra white-primrose, and all the specimens exhibit considerable variation in the extent of the black markings.

The following species of *Chlorotettix* are represented in my collection:

1. *CHLOROTETTIX UNICOLOR* Fitch.

Vertex 2½ times as broad as long, but little longer at the middle than next the eye; anterior margin very obtusely rounded. Front a little longer than broad, width at apex one-third that at the antennae. Cheeks narrow but feebly angled below the eye, forming a very narrow margin beyond the lorae. Clypeus almost rectangular. Genitalia: Male: Valve short and broad, apical margin rounded. Plates broad, sides a little concave, apices moderately produced, subacute, slightly divergent, with a few scattering spines on the margin. Female: Last ventral segment

with a rather broad shallow, subacute, notch; the edge of the thin lobe on either side, more or less sinuated or even notched. Pygofer surpassing the apex of the oviduct. Length $7\frac{1}{2}$ mm.

This insect seems to be common throughout the northern and eastern States and Canada.

2. CHLOROTETTIX TERGATUS FITCH.

Character of the head same as those of the preceding species. Genitalia: Male: Valve broad triangular, apex obtuse. Plates large, broad, covering the pygofer, their sides very slightly sinuated, their tips broad and obtuse, a little inflexed and overlapping, submargin armed with a row of short spines, margin sparsely fringed with soft white hairs. Pygofer produced superiorly in a prominent angle, and below in a curved bill-hook shaped appendage enclosing the styles. Female: Last ventral segment broad, outer angles rounded, apex truncated with a lanceolate notch reaching over half way to the base; pygofer equalling in length the stout oviduct. Length 7 mm.

This species appears to be coextensive in range with the preceding than which it is less abundant, at least in western New York. It frequents damp meadows and pastures where *Carex* and other marsh grasses abound.

3. CHLOROTETTIX VIRIDIUS n. sp.

Form of *C. unicolor* and *tergatus*. Smaller, apple-green suffused with yellow on the connexivum, or yellowish green in alcoholic specimens. Length 6-7 mm.

Front broad and convex, sutures curved outward a little below the antennae; clypeus broad, almost rectangular; cheeks unusually broad, prominently angled below the eyes, margin beyond the lorae narrow. Genitalia:

Male: Valve broad and short, resembling somewhat in form the ultimate ventral segment than which it is a little shorter, apical margin gently arcuate. Plates nearly rectangular, transverse, hardly longer than the ultimate ventral segment, slightly produced at their distal angles, outer angles rounded, margin with a few short spines and soft hairs. Pygofer lingulate, about twice as long as the valve, whitish hyaline and thin in texture. Female: Last ventral segment broadly excavated from the prominent lateral angles nearly to the base on the median line, the sides of this incisure, at about its middle, interrupted by a short, obtuse, blackish tooth. Pygofer slightly exceeding the stout oviduct.

Color apple-green; connexivum and sometimes the edge of the dorsal segments washed with yellow; rostrum, base of the antennae, tarsi, spines of the posterior tibiae and the oviduct, soiled white or even fulvous. Elytra vitreous, slightly tinged with fulvous in the male, or green in the female; nervures greenish. Wings white, iridescent, nervures colorous. Eyes dark brown.

Described from six examples collected near New York City by Mr. E. B. Southwick, in July; one female taken at New Brunswick, N. J., July 20th, by Prof. J. B. Smith, and numerous specimens received from Mr. Howard Evarts Weed, taken in Mississippi.

This interesting species may be distinguished from *C. unicolor* and *tergatus*, its nearest allies, by its smaller size, dark green color and the form of the genitalia, which differ widely from those of any other species known to me. Apparently it is very abundant in the southern states where it replaces *C. unicolor* and *tergatus* of our northern fauna.

4. *CHLOROTETTIX GALBANATUS* n. sp.

Form of *C. unicolor* but smaller, with a longer vertex. Length 6 mm.

Female. Head scarcely wider than the pronotum. Vertex longer than in unicolor and obtusely pointed before, closely and coarsely punctured. Front longer and narrower and the apex proportionately broader than in unicolor. Cheeks obtusely angled below the eye, the edge straight from the angle to the tip of the clypeus forming a narrow margin beyond the lorae. Clypeus broad, slightly widened apically. Pronotum longer than in unicolor; margin more convex before and more concave behind than in that species. Last ventral segment with a rather broad lingulate incisure reaching nearly to its base and leaving a broadly rounded lobe on either side, the inner angles of which may be either rounded off or produced in a short tooth. Oviduct very slightly surpassing the pygofers.

Color pale yellowish green, nearly uniform over the whole insect; elytra hyaline, costa green; tergum more or less embrowned,

margins yellowish; wings white, nervures slender, pale brown; eyes, tip of the rostrum, and the claws blackish.

Described from three examples received from Mr. E. B. Southwick and captured by him in the vicinity of New York City in June and July; and one specimen taken by Mr. W. J. Palmer, Jr., of this city, on Mt. Balsam, near Asheville, N. C., in July, 1889. The latter has the notch in the last ventral segment scarcely deeper than wide and the outer angles more prominent than in the New York examples. This species differs from its congeners by its produced, almost angular vertex and in this respect is not characteristic of the genus in which I have placed it. In the form of the last ventral segment it approaches *tergatus*. The male is still unknown to me.

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INTRODUCTION TO BRAUER AND VON BERGENSTAMM'S VORARBEITEN ZU EINER MONOGRAPHIE DER MUSCARIA SCHIZOMETOPA.—I.

BY C. H. TYLER TOWNSEND.

[The following translation of the introductory remarks and generalizations to be found in part i of Brauer and v. Bergenstamm's work on Tachinidae, etc., was sent me some time ago by Professor J. M. Aldrich, of Brookings, South Dakota. The translation was made in the rough by him, and at his suggestion I have revised it for publication. The original suggestion to publish it was my own. Its appearance in English will, I believe, be of advantage to American students, since a growing attention is now being directed to this family of Diptera in this country. The introduction contains many generalizations and valuable ideas not known outside of special workers in this family, and gives an insight into the methods of work employed by its authors, which is not devoid of interest even to those who may not accept in full the plan of their work as carried out.]

I do not wish to be understood as sanctioning the views here exposed. The portion treating of head-characters, other characters, relationships, etc., which comprises nearly the whole and is merely descriptive, is excellent. I agree with the authors on what is said regarding the necessity of smaller

groups (at least more restricted genera) in the Muscidae, but I do not sanction the extreme to which they have pursued this plan. Finally, I can not agree with what is said favoring the abandonment of generic names long in use.]

It is a fundamental principle in the development of the whole Dipterous stock that, from the lowest (*Orthorhapha nematocera*) to the most differentiated or highest (*Cyclorhapha schizometopa*), the actual value of the genus, and of the systematic series generally, becomes less and less. This proposition seems applicable to all groups of animals,—in all cases the most recent forms are more closely related and more difficult to characterize than older ones. For example, this is the case in the land-snails, as compared with sea-snails and mussels. The cause lies in the numerous intermediate forms occurring in a group of animals which has just reached its period of greatest prolificness.

But in particular cases this statement may not be true, for there are indeed single branches of the older groups which have only at the present time reached the stage of multiform development. With this limitation, it is true

that the related groups of the Orthorapha, and even the Cyclorapha of older origin, as the Syrphidae, are much more sharply separated from each other, and easier to establish by definite characters, than those of the Muscaria. The *Muscaria schizometopa*, which, exclusive of the Anthomyidae, are here treated, have been repeatedly divided into differently related groups, but no author has been able to establish his groups upon characters which apply to all cases. In the description of genera almost every one has overstepped, either inadvertently or purposely, the limits he had previously set. The characters applied change in their combination with such complexity that it is almost impossible to discover one which continues constant through several or many genera, much less to discover a harmony of characters indicating a natural system. After having labored long in vain to define the previously formed groups by constant characters, we have come to the conclusion that our object can only be attained in another way,—by ignoring the previously established groups of Tachinaria, Dexiaria, &c., and designating a much larger number of smaller groups, or related series. Within such a small group it is possible to determine harmoniously combined characters for a series of several genera. How these groups are to be arranged with reference to each other can, however, be settled only very imperfectly. We refer to this particularly, as it might otherwise be supposed that we wish in the sequence observed to indicate a serial

relation. To us the relations seem rather to extend in many directions from every group, and to allow no simple linear arrangement.

The question may arise, why we do not rather combine all the forms of a group into one genus with many subgenera. On this question we take the ground occupied by almost all systematic writers at the present day. In the first place, it is more intelligible to fix our stations by names than by numbers; second, our genera, with few exceptions, show only plastic characters; third, we possess several species for almost every genus, which are distinguished from each other by many subordinate differences; and fourth, we would so treat the Muscaria, and so comprehend the value of genera, as to agree with what Rondani, the best reviser of the group, has already done. Whoever begins to divide the genera Tachina, Dexia, &c., is compelled to continue the work until only those characters which are altogether subordinate remain for the species,—the arrangement of the macrochaetae, the form of the sexual organs of the male and female (not the typical development for a group, but lesser characters than these; for instance in Phaniidae), the color, hair, width of face, &c.

If we adhere to the proposition that a genus comprises only a series of species, disunited from other series by a lack of connecting forms, then we must mark off a new genus whenever, among the slight subordinate differences of the various parts of the body, new characters are found, lacking in the previous

series and therefore giving rise to a new combination. Such characters are then important, if they constantly recur in a series in combination with others.

Since a genus cannot be defined except as a natural series of related species, we refrain from entering into the distinction of subgenera, groups of species, etc. We find better stopping-places for the limitation of families, and on this point we maintain the view which was set forth in the Journal of the Imperial academy of sciences (v. 91, i. 1885, p. 327), according to which "the known larval forms furnish important characters for separation into the groups known among insects as families and genera", seldom for a higher category. The expression genus was there discarded, for two reasons: first, because many of our families are the genera of older authors, and second, because in genera in which the like or similar life habits of the larvae come into consideration among the characteristics, the larvae have acquired constant characters.

If in more recent times, strange to say, it is still disputed whether the classification should be based upon the mature insect or upon the entire development, we can quickly decide, since *the former view is contrary to all the fundamental principles of the natural system*. Whither views formed on such a basis lead, may be best seen in the new division of the Coleoptera into genuine and rhynchophorous. This comes from a misunderstanding of the value of characters derived from the earlier stages. The latter must, for

the higher categories (family, order, class, etc.), be considered of high importance; for genera and species the characters of the imago are always more important, because the larvae (with few exceptions) show far fewer distinguishing features, and by means of them one could only distinguish series [not species]. Perfectly in harmony with this is the communication presented in the Records of the Imperial academy (math. nat. class, v. 47, p. 36) on the so-called family of *Muscaria schizometopa*, where the non-existence of such a family was proved. The idea of many smaller groups was also suggested there. That the known larval forms cannot in this case prove the contrary, had been shown even earlier (Verh. k. k. zool.-bot. ges., 1878, 161. See also Loew, Stettin. ent. zeit., 1845. p. 312).

In conclusion we note particularly that it shall be our special task to establish the most natural genera possible, and in every case to attempt to reduce former genera to this basis. Whoever thinks the genera too many is at liberty to consider them merely series of species, for convenience given a definite name. Some of our groups are then to be considered as genera, while others may be subdivided.

Since our characterization of the groups is based on essentially different points of structure from those of former authors, we are in a position to arrange in our system only those forms which we could examine and of which we possess the type specimens. Species, the descriptions of which do not mention the points that are important to us, must be laid

aside for the present, because their false arrangement would only cause more confusion than already exists. Farther on in our work we will express our

views on the forms which have not been examined by us. Meanwhile we recommend that the possessors of types examine them in the light of our system.

JOHN WITT RANDALL.

Dr. J. W. Randall who died at Roxbury, Mass., 25 January 1892 is known to the present generation of entomologists as the author of two papers descriptive of Coleoptera from Maine and Massachusetts published more than fifty years ago in the second volume of the Boston journal of natural history. John Witt Randall was born in Boston, 13 November 1813. His father Dr. John Randall was an eminent physician of Boston and his mother Elizabeth Wells was the granddaughter of Samuel Adams the revolutionary patriot. He graduated from Harvard College in 1834. One of his classmates says: "he displayed a marked originality of character. Though among us, he was not wholly of us, but seemed to have thoughts, pursuits, and aspirations to which we were strangers. His tastes developed in a scientific direction, entomology being the branch to which he devoted himself. The college at that time did little to encourage such pursuits, but he pursued the even tenor of his way till he had made a very fine collection of insects." Dr. Randall studied medicine after his graduation. He was offered and accepted an appointment in zoology connected with the Wilkes exploring expedition to the South Seas; owing however to the de-

lays which occurred before the expedition sailed he resigned.

Dr. Randall's scientific papers are as follows:

1. Descriptions of new species of coleopterous insects inhabiting the state of Maine. *Bost. journ. nat. hist.*, Feb. 1838, v. 2, no. 1, pp. 1-33.

2. Descriptions of new species of coleopterous insects inhabiting the state of Massachusetts. *Bost. journ. nat. hist.*, Feb. 1838, v. 2, no. 1, pp. 34-53.

(See *Proc. Bost. soc. nat. hist.*, Jan. 1875, v. 17, pp. 373-385. On the species of Coleoptera described by Mr. J. W. Randall, by P. S. Sprague with notes by E. P. Austin.)

3. Catalogue of the Crustacea brought by Thomas Nuttall and J. K. Townsend from the west coast of North America and the Sandwich Islands with descriptions of such species as are apparently new, among which are included several species of different localities previously existing in the collection of the Academy. *Journ. acad. nat. sci. Phil.*, 1839, v. 8, pt. 1, pp. 106-147, pl. 3-7.

A volume on the animals and plants of Maine was prepared but not published.

His volume of poems entitled *Conso-lations of Solitude*, Boston, 1856, 2d edition 1857, was commended by J. H. Abbott in the *North American review*.

(Continued from page 304).

STICTHIPPIUS (στικτός, ἵππος) subgen. nov.

Head closely resembling that of *Hippiscus*, with small but deep and conspicuous triangular lateral foveolae, and between their anterior extremities a distinct, depressed, transversely biareolate field; frontal costa sulcate above, especially about the ocellus. Antennae rather slender, uniform throughout, about as long as head and pronotum together in the ♀, less than twice as long as the pronotum in the ♂, apically tapering only on last joint or two. Pronotum with the dorsal field nearly flat with a slight median carina which is occasionally subobsolete on the posterior part of the metazona and normally cut only by the typical sulcus, but sometimes slightly cut by the anterior sulcus of the prozona and more or less interrupted behind it, in which case there is a distinct discal scutellum, the posterior sulcus of the prozona terminating in two forks, one at the lateral borders of the discal scutellum, the other by deeply cutting the lateral walls of that scutellum close to the median line; metazona distinctly longer than the prozona, rectangular or obtusangulate behind; surface scabrous, the lateral carinae obscure. Tegmina as in *Hippiscus*, with scattered maculations hardly pantherine. Wings with the whole outer border broadly infumate, subvitreous apically so as to give the inner part the semblance of an arcuate band, and connecting with a broad humeral taenia which extends nearly to the base. Legs as in *Hippiscus*. Mesosternal lobes separated by a deeply truncate cuneiform median piece, the inner margins of the lobes being rapidly and widely divergent.

This subgenus is closely allied to the other subgenera of *Hippiscus*,—*Hippiscus* and *Xanthippus*, and to *Leprus*. It

differs from all most strikingly in the form of the mesosternal lobes which lie at about the same distance apart as in the two first, to which it is certainly most nearly allied. From *Leprus* it also differs in the presence of a humeral taenia on the wings. It agrees better with *Hippiscus* than with *Xanthippus* in the structure of the antennae and of the median carina of the pronotum, although itself very variable, and from *Hippiscus* it may be separated also by the biareolate sunken fastigium between the lateral foveolae of the face.

HIPPISCUS (S.) *CALIFORNICUS* sp. nov.

A compact form of rather small size. Very dull brownish fuscous, with a slight yellowish tinge, faintly flecked or blotched with dusky spots and obscurely dotted with black, the head plump and full, dark on the upper third, the rest dull clay yellow and nearly free from dots; summit of head nearly smooth, with a few dull low minute verrucosities, a faint median carina and the walls of the vertical fastigium dull but distinct; lateral foveolae small, triangular, rather deep; frontal costa moderately narrow, subequal, contracted very slightly at summit and again a little more distinctly beneath the ocellus, rather deeply sulcate especially below the ocellus. Antennae testaceous, infuscated in apical half, a little longer (♂) or a little shorter (♀) than head and prothorax together. Pronotum stout, especially in the ♀, the metazona very faintly tumid, its lateral carinae sharp anteriorly especially in the ♂; dorsal field of whole pronotum somewhat minutely verrucose, many of the verru-

cosities longitudinal, rarely closely crowded; lateral lobes minutely, closely, and uniformly verruculose on the metazona, nearly smooth on the prozona with a faint quadrate dusky spot. Tegmina ashen, becoming subvitreous apically, heavily blotched with larger and smaller rounded brownish fuscous spots, mostly congregated into basal, median, and postmedian blotches, the apical third with a few smaller indistinct cloudy spots; sutural stripe clear and generally with a rufous tinge; anal vein free. Wings very pale at base with a slight citron tinge, beyond which the nervules are all black, with a broad arcuate brownish fuscous or nebulous band, narrowing toward the anal margin, connecting with the humeral stripe which is broad and reaches almost to the base, the apex more or less infumate, and below the humeral region often wholly, generally in part, coalescing with the arcuate band. Hind femora dull clay yellow with a transverse basal band and strongly oblique, rather broad, blackish fuscous median and postmedian bands; hind tibiae and tarsi pale coral red, sometimes with a yellowish tinge, the spines black tipped.

Length of body, ♂, 26 mm.; ♀, 34-36 mm.; of tegmina, ♂, 26 mm.; ♀, 27-30 mm.

Gilroy, Santa Clara Co., California; collected by G. R. Crotch.

Described from one ♂, twelve ♀

HIPPISCUS (S.) MARMORATUS sp. nov.

I have separated from the other central Californian species of *Stictippus* two females which are certainly very closely allied to it but differ in several particulars which seem to warrant it. In particular the maculations of the tegmina are much more broken up into small spots which though more or less distinctly grouped into three large bands are not so to the same extent and the minor dots are by no means so confused therein, and are also continued with almost equal or equal sharpness to the tip of the tegmina; besides, the anal vein in passing to the margin is more or less entangled and interlocked with the axillary vein; the apical area of the wings, except for the infuscated veins, is hardly clouded but carries at the extreme tip some blackish fuscous maculations. The hind tibiae are clay yellow. The wings appear to be relatively longer and narrower than in *H. (S.) californicus*.

Length of body, 30 mm.; tegmina, 29 mm.

Monterey, Monterey Co., California.

Described from 2 ♀ received from Mr. Henry Edwards.

Subgenus XANTHIPPIUS.

HIPPISCUS (X.) CORALLIPES.

Oedipoda corallipes Hald., Stansb. expl. Utah, 371, pl. 10, fig. 2; Tayl., Rep. Smiths. inst., 1858, 206; Thom., Proc. acad. nat. sc. Philad., 1870, 79; Rep. U. S. geol. surv. Wyo., 274; Rep. U. S. geol. surv. terr., 5:456-457; 6, 720-721; Syn. Acrid. N. A. 130; Rep. U. S. surv. 100th mer., 5:879.

Hippiscus corallipes Scuddl., Bull. U. S. geol. surv. terr., 2:264; Rep. U. S. eng., 1876, 509; Rep. U. S. ent. comm., 2, app. 2, 26; Thom., Bull. Ill. mus., 1:65; Rep. ent. Ill., 9:95, 115-116.

Xanthippus corallipes Sauss., Prodr. Oedip., 90.

Generally the band of the hind wings

in this striking and well known species is broad,—more than twice as broad as the interspaces between the rays in the anal area, but occasionally individuals occur in which it is considerably narrower than that, resembling rather the prevalent condition in *H. (X.) pardalinus* from which its shorter metazona separates it.

I have seen specimens from Dakota (collected by S. M. Rothhammer during explorations under Gen. Sully), Salt Lake, Utah, June 9 (A. S. Packard), Platte River (F. V. Hayden), Barbour Co., Kans., collected by Cragin (Bruner), the South Platte country of Nebraska in the eastern half of the state (Bruner in litt.), Boulder, Colo., June 9, Colorado at an elevation of 5500' (Packard), between Lakin, Kansas, and Pueblo, Colo., from 3000' to 4500', July 8-9 (S. H. Scudder), southern Colorado, June 11-20 (Lt. Carpenter), Silver City and Albuquerque, New Mexico (Bruner in litt.), Fort Whipple, Arizona (E. Palmer), Arizona (Burrison in Henshaw's coll.), Arizona, collected by Dunn (Bruner), San Antonio, collected by Newell, and El Paso, Texas (Bruner), Dallas, Texas (Boll), and Texas (Schaupp in Henshaw's coll.); and it has been also reported by Thomas from Nevada, Cheyenne, Wyoming, and south of Raton Mts., N. Mexico. It would appear therefore to be found mainly along the plains at the eastern base of the Rocky Mountains from Dakota southward, and along the eastern margin of the Interior Basin.

HIPPISCUS (X.) ZAPOTECUS.

Xanthippus zapotecus Sauss., Prodr. Oedip., 91.

Saussure reports this species from the *ager mexicanus* simply, by which it is presumed that he found it widespread. The specimens which I have examined come mostly from Colorado collected by Morrison (Henshaw's coll.) or R. Thaxter (at Manitou, June 5-11); but Mr. Bruner has also sent me specimens from Cheyenne, Wyo., collected by Wickham, and from Silver City, Albuquerque, and Taos Valley in New Mexico; and a single specimen collected July 15 at Denison, Crawford Co., Iowa, by J. A. Allen certainly belongs here. Mr. Bruner also states that he has specimens from Akron, Colo., and Los Angeles, Calif.

HIPPISCUS (X.) CONSPICUUS sp. nov.

Similar in general appearance to *H. (X.) corallipes* with which it agrees well in size. Grayish fuscous, darkest above. Fastigium of vertex subpentagonal, broadly open behind, the anterior wall retroarcuate, all the walls slight, a faint median carina invading the fastigium; between the apices of the moderately shallow triangular lateral foveolae, a slight more or less blended biareolate foveola; frontal costa deeply sulcate, considerably narrowed above. Pronotum rather heavily verruculose, the metazona more or less deeply impressed anteriorly, slightly tumid with arched lateral carinae which are sharp and distinct anteriorly, dulled behind; process of metazona rectangulate; the median carina either depressed or obsolete between the principal sulci, gently arched on metazona. Elytra strongly pardaline (apic

ally vitreous) with strongly contrasting pale cinerous and blackish fuscous markings, with sharply defined margins, deepest in color in the marginal field, distributed much as in *H. (X.) corallipes*. Wings very pale clear citron yellow at base, apically vitreous with black longitudinal veins, the cross veins brown often inclining to yellow; and between the two a very narrow, arcuate, fuliginous or brownish fuscous band scarcely broader than the width of the interspaces, deepest in color at and beside the cross nervules, and separated by a citron line from the humeral vitta which reaches outward only to the inner margin of the arcuate band and inward half or three quarters way to the base; costal margin narrowly brownish yellow; outer margin free from the arcuate stripe for fully half its length. Hind femora pale cinereous obscurely marked with exceedingly oblique dusky stripes, beneath blood red, immaculate; hind tibiae coral red, hoary or pallid without, the spines black tipped.

Length of body, 43 mm.; of tegmina 38 mm.

The species comes from Kansas (P. R. Uhler) and New Mexico (Silver City, L. Bruner).

Described from 2 ♀.

HIPPISCUS (X.) EREMITUS sp. nov.

Similar to the preceding, but with much more broken markings on the tegmina. The single specimen having been preserved in alcohol, the colors of the head and thorax are uncertain (and the inequalities of the surface of the head intensified), but it appears to be of a rather dark grayish fuscous strongly marked with cinerous, especially in a stripe which follows the lateral carinae of the prothorax and extends to the eye. Summit of head transversely rugulose, with a median carina extending to the middle of the fastigium of the vertex which is of about equal

breadth and length with rather high angulate bounding walls, indistinct posteriorly and open in front to the small, partially biareolate, rather deep and small frontal foveola which lies between the tips of the moderately large and distinct triangular lateral foveolae, whose upper walls are arcuate; frontal costa deeply sulcate, much narrowed above, fading below. Pronotum arenaceous and rather sparsely and feebly verruculose, the metazona not deeply impressed anteriorly, a little tumid, with distinct but not high and equal lateral carinae; metazona twice as long as prozona; process of metazona slightly less than rectangulate; median carina moderately high, almost obliterated between the principal sulci, arched on the metazona. Elytra maculato-pardaline, apically subvitreous with highly contrasted cinerous and blackish fuscous markings having sharply defined margins, the latter distributed very much as in *H. (X.) corallipes* but very much diminished in size, all the dark markings together not covering one half the area of the tegmina, very much reduced in the marginal field, and in the distal portion of the discoidal field very irregular in direction, often strongly arcuate and generally also partially or completely broken by the nervules into independent but intimately connected maculations. Wings very pale citron yellow at base with concolorous reticulation, apically vitreous with black or partially fuscous reticulation, and between the two a very narrow arcuate pale fuliginous band scarcely broader than the width of the interspaces, leaving at least six marginal lobes free and separated by a brief space from the humeral vitta, which extends only as far as its inner border and inward the larger part of the way to the base, followed apically on the margin by a blackish fuscous stigma. Hind femora cinerous with three moderately broad, not very oblique, blackish brown stripes externally, beneath and the tibiae testaceous (presumably red in life), the latter with black tipped spines.

Length of body, 39 mm.; of tegmina, 40 mm.

NOTES ON SOME MYRMECOPHILOUS COLEOPTERA.

BY HENRY FREDERICK WICKHAM, IOWA CITY, IOWA.

In a recent paper published in the Proceedings of the Entomological society of Washington (vol. 1, 1890, pp. 237-247) Mr. E. A. Schwarz has listed all the North American beetles that are known to be myrmecophilous and has added notes on some that he considers doubtfully such. Two articles by Dr. Hamilton in the Canadian entomologist (vols. 20 and 21) and one by Prof. J. B. Smith in the American naturalist (August, 1886) also treat of these insects; to them I wish to add the following data which seem to be new. I am greatly indebted to Dr. Horn for determinations of many species and for suggestions regarding the new *Hetaerius* herein described; and to Prof. C. V. Riley for the names of the ants, specimens of which he had compared with those in the national collection. I have placed in that collection specimens of all the ants noted, the beetles being in my own unless otherwise stated.

Plomaphagus pusio occurs at Iowa City during April, deep in the galleries of a large black ant. This species is not on any of the previous lists.

Fustiger fuchsii has long been known as a myrmecophile but hitherto the host has not been recorded; I took it at Williams, Arizona, in the nests of a variety of *Cremastogaster lineolata*. All of our best coleopterists to whom I have sent examples of the Arizona species unite in declaring it to be the

same as the types from Tennessee.

Ctenistes pulvereus was listed by Mr. Schwarz on the authority of Dr. Leconte. By the capture of several specimens at Tucson, Ariz., I am able to verify the Doctor's observation and to record the hitherto unknown host as *Formica schaufussi*.

Lomechusa cava. This species is mentioned to call attention to the wide distribution of the genus; specimens differing little from *cava* except in size have been taken by me, with ants, in the Cascade Mts. of Washington and in the Rockies of Colorado; the species is also found in the Mississippi Valley and thence east to the Atlantic.

Gyrophæna sp. A number of specimens of this species—a true myrmecophile—were taken at Cañon City, Colorado, in the nests of *Solenopsis debilis* which they resemble so closely in color and size as to render detection somewhat difficult when the colony is disturbed and the ants in motion; the ants show no hostility towards it. From Prof. Riley I learn that this is the same species recorded by Mr. Schwarz (loc. cit. p. 224) as *Myrmecochara*? n. sp., collected by Morrison at Lake Tahoe.

Philonthus microphthalmus occurred at Iowa City in the nest of *Aphaenogaster fulva*, probably however merely as an accidental visitor; in the same nest I took a species of *Scopaeus* not yet determined.

Limulodes paradoxus is found here with the same ant as the preceding species though Mr. Schwarz takes it with *Lasius aphidicola*. I once took a specimen at Walnut, Ariz., with another ant and it will probably be found to infest the nests of several species.

Trichopteryx parallelopipeda. A specimen doubtfully referred to this species occurred with ants (*Tapinoma*) at Cañon City, Colo. This is contrary to the usual habit in this genus and is probably accidental.

A species of *Hetaerius* taken by me in Wyoming proves to be new, and as it is very distinct and the species of the genus are few, I describe it below to preserve the record:

Hetaerius hornii n. sp. Form robust, broadly sub-oval, color rufo-castaneous; surface shining sparsely covered with yellow scale-like hairs, longer on the sides and near base of the pronotum. Head with rather large tolerably dense punctures, front concave. Thorax broader than long, wider at base than at apex; divided on each side by a deep groove which is double at the base, into lateral and discal portions: discal portion shining, with a few punctures and clothed with yellow recumbent hairs, sparse at the middle but more numerous on the sides and especially at base where they are also much longer; lateral portion divided again by a deep groove about 1-3 from base of thorax into anterior and posterior divisions, the latter being sub-quadrate, convex, somewhat shining, finely punctured and covered with long yellow hair; the anterior division is irregularly oblong, wider in front, flattened, and, where the absence of hairs permits the surface to be seen, somewhat scabrous; it is clothed with yellow hairs which become longer behind. Elytra with the striae deep at base, each having the

outer margin raised, subhumeral stria reaching about two-thirds to tip. first and third dorsals entire, the tips converging, second a little shorter. The raised edge of each stria bears yellow recumbent hairs, longer on the first and third dorsals; between the inner dorsal and the suture are two rows of hairs following the course of lines of indistinct punctures. Propygidium with but few punctures visible under low power, but with higher power it is seen to be densely and finely rugose; pygidium much the same but with still finer punctures, mostly towards the sides; margins of propygidium and pygidium dark. Prosternum punctured, margined at sides, truncate at base, lobe with a moderate constriction anteriorly, extremity somewhat rounded; prosternal ridges extending two thirds towards apex, nearly parallel, merely slightly sinuate opposite the coxae. Mesosternum punctured, with distinct marginal line. Metasternum and abdomen smooth, shining. Length 2.5 mm.

Differs from *H. tristriatus*, to which it is nearest allied, in the sculpture of the thorax and in vestiture; the form of the lobe at the posterior angles of the thorax is globular in that species.

Taken by me at Cheyenne, Wyoming in the nests of *Formica schaufussi* Mayr, in May 1889. Type in cabinet of Dr. Horn to whom it gives me pleasure to dedicate it in recognition of many favors rendered.

Rhyssenus sonatus occurred with *Solenopsis debilis* at Cañon City, Colo., but this may be merely accidental as is often the case with *Aphodius granarius* which I find in the ant's nest here.

When the habits of our western species of Tenebrionidae are better known, I think it will be found that they fur-

nish their full quota of myrmecophiles. The capture of numbers of *Araeoschizus armatus* in an anthill at Green River, Wyo. has already been recorded by me (Ent. amer., v. 6, p. 84) and quoted by Mr. Schwarz in his paper cited. Though Dr. Horn holds that *Araeoschizus* is neither parasitic nor inquiline, the fact remains that they are much more abundant in and around ant's nests. I noticed this especially at Tuscon in the case of three species (*A. regularis*, *fimbriatus* and *simplex*) which I found there in considerable numbers.

Notibius puberulus is often found in ant's nests or in the immediate vicinity.

At Fort Yuma I have noticed them running across ant hills or around the entrances to the underground galleries without the interference of the ants; near Los Angeles while at work with Mr. Coquillett we dug up a large nest and found in it, besides some specimens of *Notibius puncticollis*, a number of *Conibius elongatus* and *Eurymetopon convexicollis*. I think it quite possible, considering that nothing is known of the early stages of these beetles, that they may breed in the nests, though it is also likely that they may use them simply for shelter just as *Eleodes dispersa* uses the holes of prairie dogs.

ADDITIONAL NOTES ON BOMBYCID LARVAE.

BY HARRISON G. DYAR, BOSTON, MASS.

HALSIDOTA ALNI Hy. Edw.

1876—Hy. Edw., Proc. Cal. acad. sci., vii, 129 (as a variety of *H. agassizii*).

1882—Grote, New check list, p. 16.

1891—Smith, List. lep., no. 1129 a.

Mature larva.—Head rounded, smooth, black and very shiny; bases of antennae, labium and a line below clypeus yellow; width 3.5 mm. Body black, mottled with yellowish, which predominates ventrally; abdominal feet dull yellow, the claspers brownish; thoracic feet black; spiracles white. The warts are arranged as in *H. maculata** and bear dense, spreading tufts of feathery hairs of even length, but slightly longer dorsally on joints 5 and 12, and keeled along dorsal line. On joints 2-6 and 10-13 the hair is deep black, on joints 7-9 orange ochraceous†. In the black parts at

both ends are several long, thin, white pencils, consisting of from one to several hairs and arranged as follows:—on joints 3 and 4 from warts 2-5; on joint 5 from warts 1-5; on joint 6, a single hair from warts 3 and 4; on joint 10 a single hair from warts 2-4; on joint 11 from warts 2, 3, and 5; on joint 12 from warts 1 and 2 and on joint 13 from the large wart and the lateral one.

Food plants.—Willow (*Salix*) and alder (*Alnus*).

Habitat.—The Sierra Nevada range of California and probably further north. Mr. Edwards's example came from Shasta Co., mine from Mariposa Co.

HALISIDOTA AGASSIZII Pack.

1864—Packard, Proc. ent. soc. Phil., v. 3, 128.

1873—Stretch, Zyg. Bomb. N. A. v. 1, 103
1889.—Hy. Edw., Bull. no. 35, U. S. nat. mus., 62. *pr. var.* of *maculata*.

1891—Smith, New list, p. 27. *maculata*.

* See Psyche, vol. 6, p. 165.

† Ridgway's Nomenclature of colors, pl. v, fig. 3.

Mature larva.—Very variable in color. The head is as in *H. alni* described above, the color of the body varies much in the amount of black from entirely black to nearly all yellowish. The hair is like that of *H. alni* in structure and the white pencils are the same or partly yellowish, but the hairs that arise from the warts and obscure the body are nearly maize yellow* and the amount of black at the ends of the body is variable. Besides there is usually present the series of lozenge-shaped black dorsal tufts on joints 5-12 which is seen on *H. maculata*; but these may be much reduced, or absent. I have not, however, seen any examples in which they were wanting which also had the black extremities well developed. One example occurred to me with its hair entirely yellow except the white pencils. From this there are all intergrades to a form with joints 2-6 and 10-13 bearing deep black hairs besides the black dorsal tufts on joints 7-9 and the usual white pencils. Examples occur that are not to be distinguished from *H. maculata*, that is with only the eight dorsal tufts colored black. A singular variety was found with joints 4-5 and 10 posteriorly to 12 and the dorsal tufts on joints 6-10 black, joints 2, 3, 12 laterally, 13 and all the hair from warts 3-6 on joints 6-10 white, the hair from warts 1-2 on joints 6-10 yellow. White pencils normal.

Food plants.—Willow (*Salix*) and alder (*Alnus*).

Habitat.—California, in low land near the coast. (Santa Barbara and San Francisco).

ORGYIA LEUCOSTIGMA Smith and Abbot. 1797—S. and A., Lep. ins. Ga., 157, pl. 79 1889—Hy. Edw., Bull. no. 35, U. S. N. M., p. 63 (gives 23 references).

1889—Packard, 5th rept. U. S. ent. com., p. 262.

In spite of the fact that the larva of this species has long been known and excellently illustrated and described by Dr. Riley, I

have seen no account of the preparatory stages that agrees with my observations. Dr. Riley says:—"Six days after the third moult" [*i. e.* at the end of the fourth stage] "a portion of the larvae spin up; these all produce male moths. The female caterpillars . . . undergo a fourth (and as, it appears from more recent experience, in some instances even a fifth) molt . . ." That is, male larvae have four stages and female, five or six. In my experience, male larvae have six stages and female six or seven (usually seven) just as is the case also with *O. definita* Pack. and *O. cana* Hv. Edw. which I have described.

I give briefly the stages as I have observed them.

Egg.—Nearly spherical, smooth, not shiny; color yellowish white, a large round pale brownish spot at the vertex surrounded by a ring of the same color. Diameter 0.9 mm. Laid in a mass on the cocoon of the ♀ moth and covered with froth which becomes hard and white when dry.

First larval stage.—Head shiny, pale, subtranslucent brownish, darker on the vertex; ocelli black, mouth brown; width 0.5 mm. Body pale whitish, the warts concolorous, except the subdorsal ones which are blackish, those on joint 2 larger than the others. An indistinct white dorsal line; venter and legs pale. Hair very long, irregular, no brush-tufts, pencils nor retractile tubercles.

Second stage.—Head pale reddish brown; width 0.8 mm. Body pale yellowish, a subdorsal black band and a broad dorsal one on joints 9-12; a brick red dorsal shade on joints 4 and 9; a few plumed black hairs from the subdorsal warts on joint 2 and the dorsal on joint 12; retractile tubercles present, one each on joints 10 and 11 dorsally, pale yellowish, just tinged with red, but distinct. Cervical shield yellowish.

Third stage.—Head brownish red, mouth darker; width 1.1 mm. Cervical shield orange. Body pale yellow dorsally, a broad dark gray lateral band and black dorsal band, triple on joints 3 and 4, wide on joints 5-8

* Ridgway's Nomenclature of colors, Pl. vi. fig. 21.

(touching the lateral band), narrower on joints 9-12 and absent on joint 13. Long plumed pencils on joints 2 and 12; brush-like tufts of pale yellowish hair on joints 5-7, with traces of another on joint 8; retractile tubercles large, coral red. Hair thin, long and black; warts pale grayish. The markings of the mature larva are practically acquired at this stage.

Fourth stage.—Head and retractile tubercles coral red; cervical shield orange; width of head 1.6 mm. Body as before but the brush-tufts are complete on joints 5 to 8 and colored white or yellowish.

Fifth stage.—Head, cervical shield and retractile tubercles coral red; width of former 2.1 mm. The ornamentation is as before; the space between the dorsal and lateral bands is yellow on joints 9-12.

Sixth stage.—(♂ mature larva) Head dark coral red, slightly shiny, ocelli a little darker, jaws brownish; width 2.5 mm. Cervical shield and retractile tubercles coral red; warts pale yellow shaded with blackish, arranged as in the other species of *Orgyia*; hair pencils on joints 2 (two) and 12 (one) composed of long, plumed, black hairs; four large, white or yellow brush-like dorsal tufts on joints 5-8. A broad velvety black dorsal band enclosing the small yellow tubercles of row 1 and the red retractile ones; on joints 3-8 the dorsum is all black except the warts; a yellow subdorsal band; lateral region dark gray except the warts, joint 13 only shaded with gray; a yellow substigmatal band; a black stigmatal line; venter gray and legs pale yellow. Hair long, thin and black.

Seventh stage.—(♀ larvae only.) As in the previous stage; width of head 3.5 mm.

Cocoon.—Double, composed of hair and silk, but thin.

♂ pupa.—Cylindrical; antenna and wing cases prominent; abdomen tapering, the cremaster flattened, its hooks fastened in the silk of the cocoon. Color yellowish white or more or less shaded with dark brown or

black, the back covered with long hair and three dorsal tufts of short scales. Length 13 mm.; width 5 mm.

♀ pupa.—Like the ♂, but larger and more robust. The wing cases are present, 6.5 mm. long, (though the wings of the ♀ moth are but 2.5 mm. long) but the antenna cases are small.

OEDEMASIA SALICIS Hy. Edwards.

Egg.—Hemispherical but rounded at base, base flattened centrally; smooth slightly shiny, under the microscope divided into small hexagonal areas, their boundaries not distinctly raised and hardly distinct enough to form reticulations; diameter 0.8 mm. Laid over 100 together on the under side of a leaf. The little larva hatches by eating a large hole in the top.

Food plants.—Maple (*Acer macrophyllum*) and apple (*Pyrus malus*) and also, according to Mr. Edwards, willow (*Salix*) and according to Dr. Behr, walnut (*Juglans*).

SCHIZURA CONSPECTA Hy. Edwards.

1874—Hy. Edw., Proc. Cal. acad. sc., v. 5, 366. *Heterocampa* (♀).

1882—Grote, Check list, p. 19. *Coelodasys*.

1891—Smith, List lep., No. 1311. *Schizura*.

I found a larva, which may belong to this species, in Yosemite, Cal., but it was unfortunately destroyed while I was attempting to rear it. As there is no other species of *Schizura* known from California, I give what notes I was able to obtain under the above heading.

Egg.—Spheroidal, flattened at base; diameter 1.1 mm. Under the microscope it is seen to be covered with very narrow slightly elevated lines forming irregular pentagonal or hexagonal reticulations, becoming very small at the micropyle. Laid together on the under side of a leaf. The little larva hatches by eating a hole in the side.

First larval stage.—Head bilobed, rounded, very shiny blackish brown, yellowish at the vertex; ocelli black; a few hairs; width 0.6 mm. Cervical shield with a pair of tubercles; joints 5 and 12 slightly enlarged dorsally;

feet normal, but the anal pair elevated; smooth, rounded-conical tubercles, normal in arrangement, rather large and each bearing a long hair, many of which are swollen at the tip. Body honey yellow, the humps and lateral region wine red; cervical shield, anal plate, tubercles and anal feet blackish; other feet shiny black.

Second stage.—Head bilobed, high, narrowing to vertex and flat in front; a tubercle at the vertex of each lobe; width 0.8 mm; uniform brown, not shiny, the vertex a little darker. Body slightly enlarged dorsally at joints 5 and 12, the tubercles very large, especially dorsally, conical, smooth, each with a short seta which is transparent and swollen at tip. Anal feet elevated, partly aborted. Body reddish brown, lighter dorsally and mottled with yellow; joints 5 and 12 are dark as are also the tubercles. Cervical shield and anal plate dark. A yellow dorsal spot on joints 4 and 11 bisected by a brown dorsal line.

Food plant.—Maple (*Acer*).

CLISIOCAMPA CONSTRICTA Stretch.

Var. STRIGOSA Stretch.

1881.—Stretch, *Papilio*, v. 1, p. 67.

1882.—Grote, Check list, p. 21. *Sp. dist.*

Mr. Stretch described this form apparently from a single ♂ example from the Yosemite Valley and in Grote's list it stands as a distinct species. This is an error, however, as *C. strigosa* is merely a local form of *C. constricta* hardly differing sufficiently to deserve the varietal name.

The principal differences noticed by Mr. Stretch in his description seem to be the larger size of *C. strigosa*, the greater width of the band on fore wings, the distinct spots on the fringe and the common line on the wings below. From the series of bred specimens before me, these characters are seen to be decidedly variable, and many of the specimens are nearer to the typical form than to Mr. Stretch's description of *C. strigosa*.

The larva is identical with that of *C. constricta* as described by Mr. Hy. Edwards.

The larvae form no tent, but live in the manner of *C. distria*, separating as they become large and wandering about considerably before forming their cocoons. In the Yosemite Valley they feed on the black oak (*Quercus kelloggii*).

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INTRODUCTION TO BRAUER AND VON BERGENSTAMM'S VORARBEITEN ZU EINER MONOGRAPHIE DER MUSCARIA SCHIZOMETOPA.—II.

BY C. H. TYLER TOWNSEND.

The *Muscaria schizometopa* are divided first into two groups: the Anthomyidae and Muscariae genuinae. The first show the costal vein continued to the end of the fourth longitudinal, and usually have small tegulae; the latter have between the third and fourth longitudinal, where the apical crossvein is lacking, only a membranous margin, and usually the fourth longitudinal before its end bent toward the third and terminating close behind it, or at the curve dividing into a posterior false vein, or a true one, which runs toward the edge, but seldom reaches it, and an apical crossvein, which ends near the third longitudinal, or even in it (first posterior cell open, or petiolate). Rarely the apical crossvein is lacking and the fourth longitudinal ends in the posterior margin, or before reaching it (Syllegoptera, Melia, Microtricha, Thrixion, Gastrophilus). Tegulae generally large, rarely small.

The Conopidae are separated from the Tachinidae, Muscidae, and Anthomyidae by their lack of vibrissae, and also by the disappearance of the vibrissal angle; while the cheek-margins, by their vibrissal ridges, either pass almost

imperceptibly (only with a slight curve—*Myopa dorsalis* Fab.— below the middle of the face, or on the under edge of the head—*Myopa picta*) into the edges of the antennal grooves, or else (Conops) reach entirely up to the antennal prominence and bound the facial keel, and the antennal grooves are wanting [but this arrangement produces a very good imitation of antennal grooves].

The structure is similar in the Oestridae, where the vibrissal angles close up the antennal grooves below on both sides high above the oral margin, while the last continues up between the cheek-edges as a broad clypeus with a flat or edged facial keel (Hypoderma). In the Acalyptratae the clypeus forms the edge of the antennal groove below, and the angle is lacking (Dichromyia). The Cordyluridae, Scatophagidae, Helomyzidae, Sepsidae, have near the mouth the vibrissal angle and one vibrissa. Head like Macquartia. The boundaries of cheeks, vibrissal ridges, clypeus, etc. are best distinguished in Phasiidae (Trichopoda).

These parts of the head structure have been already described in general in the

monograph of the Oestridae (1863), and in the work on the Diptera of the Imperial museum of Vienna (Denkschr. acad. wissensch., v. 42, p. 108); therefore it is necessary here only to repeat briefly the principal characters, and to discuss those of chief importance from the new standpoint. The terminology employed is the same as that of earlier authors, so far as known, so that the comparison of our descriptions with those of others may be as easy as possible. Our terms differ from those of other authors only where an understanding of single parts made the addition of new terms necessary. This was particularly the case with the chitinous plates forming the epistoma [clypeus.]

In the Schizometopa the head is divided by a seam or fissure in front and above into two parts, which merge into each other below near the cheeks. This seam is more or less perpendicular to the longitudinal axis of the body, and runs as a curved wrinkle around the upper edge of the antennal prominence and thence downward, generally in a horseshoe shape. Above and outside of the curved seam lie the so-called front, the vertex and ocelli, the compound eyes, and the cheeks; below and inside the seam lie the lunula with the antennae, the epistoma (which generally deepens above into the antennal grooves and forms below the front edge of the oral cavity), and on both sides of the last the *vibrissal ridges*, reaching downward a greater or less distance, or disappearing by abbreviation. Each of these is separated from the clypeus

by a furrow or seam, extending from the outer half of the antennal groove. The vibrissal ridges usually form at the lower end a small raised or re-entrant angle, pointing toward the middle line of the face,—the so called *vibrissal angle*, on which as a rule the longest bristles (or the genuine vibrissae) are located. When the clypeus lies in a hollow, the vibrissal ridges bound the facial groove, which must be distinguished from the antennal grooves, inasmuch as the latter may be secondary excavations within the former, or may occur alone with a smooth or elevated clypeus and often are united in a single groove (Dexiosoma). The last is always the case when the vibrissal ridges are lacking or abbreviated and the vibrissal angle forms the lower boundary of the antennal grooves. Longer bristles are often situated in that case on the outer edge of the antennal grooves, because the latter are identical with the facial groove (Oestromyla).

The position of the vibrissal angle has a relation to the lateral end of the curved seam. The latter often ends close to the vibrissal ridges, having a linear form; or the two ends may be more widely separated, enclosing a larger facial area (clypeus+vibrissal ridges and antennae) and ending close to the lower edge of the eye with a larger or smaller groove (the bow-groove, facial impression, oblique impression, of other authors), by which the upper and lower portions of the cheek [sides of face and cheeks] are sharply separated. If the end of the

curved seam is close to the edge of the mouth on each side, the long vibrissa on the vibrissal angle is close over or on the edge of the mouth (Phorocera); if, however, the curved seam ends high above the edge of the mouth (Macronychia, Phasia, Oestrus), the vibrissal angle and the long vibrissa (or if the latter is lacking, the angle is distinct) are high above the mouth, and the angle forms sometimes the lower edge of the antennal groove. The vibrissal ridges are therefore sometimes long, sometimes short or absent (Oestridae).

These variations have their effect on the clypeus. When the vibrissal angle lies low down, the clypeus generally reaches far below, and runs out past it or ends between the two; if the vibrissal angle rises higher, it is apparent that it is not correlated with the edge of the mouth, as that was before between it and the facial depression, but it may stand much higher than the edge of the mouth (the lower edge of the clypeus), and the latter run through between the angles, or separate them with a nose like ridge, or the clypeus above the edge may by their convergence (re-entrant vibrissal angles in Macronychia, Dexia, and others) be narrowed before its end, or in the middle, or entirely above (clypeus biscuit-shaped or half biscuit-shaped). If the vibrissal angle ends high up and bounds the antennal groove below and on the outside, then the downward-reaching clypeus is set off from the cheek edges—extending forward in this case—by the angle, and forms, if narrow, a facial ridge, furrow

or groove (Dexiosoma, Oestrus); or, if it broadens below the antennal grooves, it forms a smooth or convex facial shield (Hypoderma).

The region bounding the oral aperture on the side is called the cheek, and its *so-called breadth* is really its height in a profile view. Compared with the vertical diameter of the eye, it is generally called *broad*, if it measures 1-3 or more of the latter; and *narrow*, if it measures 1-4 or less. The breadth is also the diameter of the cheek from the lower edge of the eye to the lower edge of the head, measured in profile while the posterior margin of the eye is in a vertical position.

Bristles on the edges of the frontal stripe from the vertical area to that of the upper cheek (sides of face) are called frontal bristles or stripe-bristles; if they are in several rows, the supernumerary rows are on the orbital region, and we may speak of "several-rowed frontal bristles." Those on the ocellar triangle are ocellar bristles. Longer ones, at the extreme top of the head near the ocellar triangle, are vertical bristles. Single or paired bristles, or several in a group, on the periorbit near the edge of the eye below the lateral vertical bristles are called *orbital bristles*. They occur mostly in the female, but often in both sexes, are rarely entirely lacking, or are represented by rows of finer inconspicuous bristles (many Muscidae and Phasiidae). As a rule the orbital bristles are strong and bent downward, rarely upright or bent outward. Bristles sit-

uated on the edges of the vibrissal ridges, and the long one on the vibrissal angle are called vibrissae. If the ridges bear such bristles up to above the middle, the term "vibrissae ascending" is used to describe the character. If they are in a single row, they are simple or one-rowed; if in two or more, they are double rowed or bushy. Bristles on the edge of the cheeks (sides of face) may be mistaken for ascending vibrissae, but check vibrissae are always *below* the vibrissal angle. . . .

In relation to wing structure, we adopt in general the terminology used by Meigen, and therefore differ from Rondani in the names of the veins.

The larger bristles on the abdomen we (with Rondani and Macquart) call macrochaetae; those on the posterior margin of the segment marginal, and those on the surface of the dorsal line discal. If these bristles stand at the side of the body, they are lateral. When we speak distinctly of discal and marginal macrochaetae, we always mean those in the dorsal (sagittal) line. If a further distinction is necessary, the bristles of the posterior edge may be distinguished as of the whole margin, or discal, or lateral; or, if in the middle only, as sagittal. Some tropical forms show particularly large bristles which are thick and straight, like *spines*, and often cover the whole abdomen, or stand together in groups, *bush-like*. Van der Wulp distinguishes these spines in certain groups, and we follow him in this respect in the distinction of *narrow* groups. But they form no character of a particular group but occur in several, which are sepa-

rated from each other by other structures. All the remaining terms should be intelligible, as we follow entirely the methods of expression of Loew, Schiner, etc.

In regard to generic names, it has been our intention to retain the old name for that part of the genus to which the oldest species belongs. If that is impossible, on account of the name having been proposed for several species which now belong to other genera, the name must either be used in a narrower sense or discarded, because in the retention of names which had one meaning originally, and another quite different one now, only confusion and misunderstanding can arise. It is desirable also that describers of new species should not enlarge or narrow our genera as soon as species are found not exactly corresponding with their characters, but rather that they erect new genera, for the very good reason that, after this kind of modification by little patches has gone on for a time, it will be impossible to characterize the genus. . . .

The majority of authors seem never to have troubled themselves to give any account of the ideas represented by Tachininae, Dexinae, Phasinae, etc., but in all these cases to have had only one definite form in mind, so that the characters belonging to the name long since ceased to have any weight, when the habitus of the form under consideration suggested these groups. But how a different appearance may conceal relationship, and how similiarity with unrelated forms may deceive, no genus ever illustrated so strikingly as *Scenopinus*.

(Continued from page 320).

Described from 1 ♀ in the collection of Mr. L. Bruner and taken by Dunn in Arizona.

HIPPISCUS (X.) PARDALINUS.

Oedipoda pardalina Sauss., Rev. mag. zool., 1861, 324; Orth. nova amer., 2, 27; Thom., Syn. Acrid. N. A., 213-214.

Xanthippus pardalinus Sauss., Prodr. Oedip., 90.

This is a very widespread species. I have seen specimens from Nevada; several localities in Utah, all of E. Palmer's collecting. as Mt. Trumbull, June 7-10, Mokiak Pass near St. George, April 20-30, Parowan, 6000' in irrigated fields near low mountains, July 3-10; San Diego and Rock Spring in southern California (E. Palmer); the state of Vera Cruz, Mexico (Bruner), and the vicinity of Mexico, Mex. (E. Palmer). Saussure mentions it from California, New Mexico, Orizaba and Puebla, Mexico, and from the West Indies and Venezuela. In the United States, then, it has not been found east of the Rocky Mountains nor north of Lat. 40°.

HIPPISCUS (X.) MACULATUS sp. nov.

Head of moderate size not very tumid above; dull cinereous, more or less fuscous above; median carina of vertex slight, terminating in the middle of the fastigium, opposite which the low lateral walls are considerably angulated; biareolate apical foveola subcircular in ♂, obscure and transversely elliptical in ♀: frontal costa rather deeply sulcate, narrowed considerably above. Pro-

notum plane above, the median carina low, of uniform height, cut by both sulci and more or less obsolete between; lateral carinae sharp, distinctly passing over under the pronotum; process of metazona rectangulate or less, the surface variable but verruculose or coarsely arenaceous, the tendency of the verrucosities to be longitudinal; lateral lobes bluntly subdued verrucose; dorsum of pronotum blackish fuscous with obscure pallid, subdecussate, strongly divergent, posteriorly narrowing stripes; lateral lobes obscure with a median semilunate blackish patch seated on a small quadrate whitish spot. Tegmina cinereous marked with rounded blackish fuscous and minutely black edged spots having much the position of those of the species which have here preceded but generally more rounded, more contracted, and hence more distant than in them, the sutural stripe rather broad, clear, and testaceous. Wings pale citron at base, the apex vitreous with black reticulation, and between a moderately broad, blackish fuliginous, arcuate band scarcely narrowing above and united, except for the slender pallid axillary line, with the humeral vitta, the outer limit of which is opposite the middle or inner margin of the arcuate band, and which narrows and becomes duller as it passes toward the base which it is far from reaching; inner portion of costal margin citron as far as below, followed by a slender blackish stigma. Hind femora externally hoary cinereous below, darker above, with very oblique broad blackish stripes and apically a semilunate black spot; beneath and apically within coral red; hind tibiae coral red, externally hoary with black tipped spines.

Length of body, ♂, 33.5 mm., ♀, 38 mm.; of tegmina, ♂, 35 mm., ♀, 34 mm.

A specimen from Colorado collected by Morrison is in Mr. Henshaw's collection, and in mine a ♂ from Pueblo, Colorado, which I collected on July 8 or 9 and a ♀ from San Luis Potosi,

Mexico (E. Palmer). Mr. Bruner also sends me a specimen from Ft. Grant, Arizona.

Described from 1 ♂, 2 ♀.

HIPPISCUS (X.) TIGRINUS sp. nov.

Dark brownish fuscous, of robust form and medium size. Head narrowed above and rugulose; fastigium of vertex distinct with rather sharp though not high bounding walls, closed behind by a distinct but slight transverse more or less arcuate and irregular carina, the posterior half with a slight median carina which extends back more or less distinctly over the head; lateral foveolae not deeply impressed, triangular, the median foveola between their tips slightly impressed: frontal costa moderately broad, narrowed at summit much more than below the ocellus, deeply sulcate at the ocellus, plane at the considerably expanding base. Pronotum expanding considerably on the metazona, which is centrally a little tumid, the rugosities of the latter, which are considerable, ranged more or less distinctly into series parallel to the sides of the process; median carina subobsolete or at least depressed between the sulci, distinctly arched on the metazona; lateral canthi distinct and sharp in the middle of the pronotum, a faint rather broad ashen band next their inner side; process rectangulate or less. Tegmina ashen gray, brownish at base, vitreous on apical third or more, the transverse bars dark brownish fuscous, mostly crossing the wing, those of apical half not at all rounded, with rare exceptions with ill defined irregular margins, and extending though fainter to the tip of the wing; sutural line testaceous. Wings very pallid citron at base, pellucid at tip, occasionally with one or two fuliginous cellular spots at tip, the veins and cross veins blackish on apical portion, yellow on basal, with a broad, subequal, arcuate, dark fusco-fuliginous, median, scarcely tapering band, leaving four or five lobes free, separat-

ed by a yellow line from the humeral vitta which extends from very nearly as far out to the base of the wing, the costal margin fusco-testaceous. Hind femora externally brownish fuscous with only obscure if any darker very oblique bars, dirty clay yellow below, the under surface, like the tibiae and tarsi, luteous, the spines black tipped.

Length of body, 39 mm.; of tegmina, 37 mm.

The species is somewhat widely spread, mostly at the eastern base of the Rocky Mountains, extending from Colorado? (collected by Lt. E. G. Beckwith's party of Pacific R. R. exploration near Lat. 38° West Point, Nebraska (Bruner), and Nebraska (Miss Walker) to Ft. Buchanan, south of Tucson, Arizona (E. Palmer). A specimen received from Mr. P. R. Uhler has no designation of locality.

Described from 5 ♀, but the description is drawn up mainly from Mr. Uhler's specimen, the others having been first immersed in alcohol.

HIPPISCUS (X) LEPROSUS.

Xanthippus leprosus Sauss., Prodr. Oedip., 92.

I possess two poor ♀, originally preserved in alcohol, both of which come from much further north than de Saussure's locality (New Mexico), one of them collected by Dr. Suckley below Lake Jessie at Ft. Benton, Montana, during the N. Pacific R. R. surveys, the other from Colorado (?) by Lt. E. G. Beckwith on the Pacific R. R. surveys about Lat. 38°. Mr. Bruner also sends me a specimen from Reno, Nevada, collected by Hillman.

HIPPISCUS (X.) PARADOXUS.

Oedipoda paradoxa Thom.!, Rep. U. S. geol. surv. terr., v, 457; 6, 720-721; Syn. Acrid. N. A., 132.

Not *Oe. paradoxa* Glover.

Brownish fuscous, of robust form and medium size. Head dark above, cinereous or pallid below, often marked laterally by two narrow oblique brownish fuscous stripes, one running from behind the eyes across their lower edge to the middle of the frontal costa, the other parallel to and distant from it across the lower part of the cheeks; rugose above including the fastigium of the vertex which is as broad as long and bordered in its entire circuit, sometimes less distinctly in front and behind, by strongly sinuous sharp and moderately high bounding walls; lateral foveolae moderately deep, short triangular, including between their tips a distinctly biareolate broad oval deep foveola; frontal costa almost exactly as in *H. (X.) tigrinus* but sulcate more deeply and for a longer distance and expanding more considerably at base. Pronotum shaped as in *H. (X.) tigrinus* and as there rather deeply stabbed on either side of the middle of the front margin of the metazona, the latter more vaulted, the rugosities especially in ♀ profuse, subarenaceous, elevated, blunt, and pretty uniformly distributed; median carina of metazona pretty strongly arched but still rather slight and low; lateral carinae generally distinct and sharp but slight; lateral lobes nearly smooth in ♂, bluntly rugulose in ♀; dorsum sometimes marked by a broad bent ashen band on either side. Tegmina cinereous, very heavily barred with dark brown, on the costal margin sometimes blackish, transverse bands nearly or quite crossing the tegmina, almost or quite confluent below and occupying four-fifths or considerably more of the tegmina, extending to the tip, so that the tegmina may be rather regarded as brown with narrow transverse ashen stripes broadening above, one ashen patch larger than the

others usually found situated on the costal margin, its outer limit at the middle of the margin; a rather broad sutural stripe beneath which the tegmina are almost or quite wholly brown. Wings pallid at base with a citron tinge, the veins and cross veins of the same color, vitreous apically, with occasionally a fuliginous cellular spot or two near the apex, the reticulation black with a narrow rather strongly arcuate fusco-fuliginous median band, occasionally broadened a little, especially in the middle of its course, leaving about four marginal lobes free, separated by an often scarcely perceptible yellowish line from the humeral vitta, which reaches to the outer limits of the upper extremity of the arcuate band and extends nearly (♀) or less than three quarters way (♂) to the base, the costal margin testaceous interrupted with fuliginous at the extremity of the vitta. Hind femora pallid cinereous, with three well defined, moderately broad, strongly oblique, distinct dark brown stripes; beneath and within coral red like the tibiae which are more or less pallid externally especially at the base, the spines black tipped; hind tarsi luteous.

Length of body, ♂, 33 mm.; ♀, 37 mm.; of tegmina, ♂, 31 mm., ♀, 37 mm.

Described from 3 ♂, 7 ♀, most but not all killed in alcohol.

One specimen comes from Holt Co., Nebraska (L. Bruner, May); the others from Utah (Parowan, July 3-10, about 6000', near low mountains on an irrigated spot; Mokiak Pass near St. George, April 20-30, E. Palmer), Taos Valley, N. Mex., May 30 (Bruner) and Arizona (Ft. Whipple, E. Palmer; also collected by Dunn, Bruner).

A single type of this species, a ♀, exists in the National museum, dried after immersion in alcohol, leaving no trace

of the red color to the wings. It differs from Thomas's description in that the "dorsal area" (axillary field) of the tegmina is not without spots, though such specimens do occur, especially in the ♂. As his description is very insufficient and his remarks on its relationship misleading, I have printed here the description drawn up from my specimens before I had seen his type. I had formerly supposed his species to be a synonym of *H. (H.) haldemanii*. Glover's figure (pl. 18, fig. 14), presumably from specimens furnished by Thomas, is pretty certainly that species. It does not at all agree with the present species.

The distribution of the species as given above must therefore be slightly extended. Thomas's original specimens were found from Ogden to Smithfield in Cache Valley, northern Utah; and he subsequently adds southeast Idaho.

HIPPISCUS (X.) AFFRICTUS sp. nov.

Very dark brownish fuscous, of robust form and medium size, the sexes varying considerably. Head dark on summit but elsewhere mottled with pale cinereous and light brownish fuscous, the summit moderately broad and tumid, gently rugulose, the tolerably smooth-floored vertical fastigium open behind or with the lateral walls incurved somewhat, open also in front to the large and rather deep biareolate median foveola; lateral foveolae very small subcircular, the lower walls obscure; frontal carina of moderate width, deeply sulcate throughout, though the sulcus fades at base, considerably narrowed at summit, more or less expanding at base, at least in the ♀. Pro-

notum expanding but moderately behind, the process variable but generally slightly less than rectangulate, the dorsum broadly edged laterally with an oblique, broad, usually posteriorly narrowing, pallid cinereous band; margin of process edged with testaceous; lateral lobes of prozona cinereous flecked with brown and with a large median oblique dark brown spot; metazona more or less but not greatly tumid centrally, the median carina arched, distinct and sharp, not elevated, and equal; lateral carinae distinct and sharp, longer than usual and centrally elevated; dorsal surface of metazona arenaceo-rugulose but not very heavily marked. Tegmina cinereous and brownish fuscous, the latter in more or less transverse broad belts but all, as in the next species, somewhat confused and blurred, giving it a more maculate appearance than usual, the cinereous markings prevailing along the costal third of the wing, where also the darker markings are usually darkest; a broad and rather bright flavo-testaceous sutural stripe. Wings pale citron, rarely salmon-red at base, the reticulation the same, vitreous with black reticulation at apex, with occasionally a cellular spot or two and a broad or rather broad, arcuate, median, blackish or very dark fuliginous band, gently narrowing toward the anal angle which it just reaches, not at all or but slightly narrowing above and separated by a generally fine yellow line from the humeral vitta, which reaches to or nearly to its outer margin and usually extends almost to the base, the costal margin of the basal color (generally a little dulled) interrupted with blackish at the extremity of the vitta. Hind femora and tibiae as in *H. (X.) devotus*.

Length of body, ♂, 29-30 mm., ♀, 37-43 mm.; of tegmina, ♂, 28-30 mm., ♀, 38-40 mm.

Described from 5 ♂, 12 ♀, mostly fresh.

THE NUMBER OF LARVAL STAGES IN THE GENUS NADATA.

BY HARRISON G. DYAR, BOSTON, MASS.

In *Psyche*, recently, I expressed the opinion that species of *Nadata* had more than six larval stages, which was founded on certain measurements made from *Nadata gibbosa*. I have not since obtained this species in the early stages,* but have bred another from the egg, which is *N. oregonensis* Butl. In this species, the number of stages appears to be normally six; but two individuals,

carefully bred in confinement and two bred in the open air had but five stages, while another specimen, less carefully reared in confinement beside another bred in the open air on its growing food plant under a net exhibited six stages, but not the normal ones. All the larvae appeared to omit the normal second stage, even those that had six stages. These latter inserted an extra stage between the fourth and fifth, not differing in markings from the fourth, as will be seen in what follows. The growth during the first stage was very great, out of all proportion to the subsequent growth, and, previous to moulting, the new head in process of formation behind the old one, caused an enormous projection of the body.

The calculated normal series for the widths of head stands as follows:—I .79, [II 1.13,] III 1.62, IV 2.31, V 3.3, VI 4.7 mm.; ratio .70.

From the larvae that had five stages, I obtained the following measurements:—1st, .75, 2nd, 1.55, 3rd, 2.35, 4th, 3.3, 5th, 4.7 mm.

From those that had six stages: first example:—1st, ,* 2nd, 1.4, 3rd, 2.2, 4th, 2.7, 5th, 3.2, 6th, mm.:† second example:—1st, ,* 2nd, 1.5, 3rd, 2.3, 4th, 2.8, 5th, 3.7, 6th, 4.8 mm.

* Miss Soule has recently written the life history of *N. gibbosa* (*Psyche*, v. 6, 197) and found five stages, as did also Dr. Riley (See 5th rept. U. S. ent. com., 1890). Unfortunately, Miss Soule has given no measurements of the head, but she has given the length of the larva in all its stages and the numbers she gives correspond well with a series derived with the ratio .60. This does not corroborate my observations (on *N. oregonensis*), as, to do so, a stage should appear lacking between stages I and II, provided that the measurements were made at the first of each stage. Miss Soule's figures are 3.16 (=19), $\frac{1}{4}$ (=25), $\frac{1}{4}$ (=50), $\frac{1}{4}$ (=75), and $1\frac{1}{4}$ (=125) inches while the calculated series would be .16, .27, .45, .75, 1.25 in., thus showing no gap in the series anywhere. To suit my observations the newly hatched larva should have measured .10 inch instead of .16 inch. Miss Soule says "not quite 3.16 in.," which is certainly nearer .16 than .10, as the latter would be not quite $\frac{1}{4}$ in.

But I do not think the length of the larva is a reliable measurement to take as it is subject to great change throughout the stage, and, even if taken as nearly as possible at the same time in each stage, is subject to inaccuracies through the expansion or contraction of the larval segments. Moreover it takes no account of the growth during either the first or the last stage, according as the measurements are made at the end or beginning of each stage, and I should hesitate to assume that the growth was always strictly proportional. In fact, I believe that in *Nadata* it is not so, for double growth seems to take place in the first stage.

The measurement of the width of head is open to none of the above objections and possesses besides several advantages not shown by measurements of the length of the larva.

* Measurement not recorded.

† This larva died before moulting the last time.

It will be seen that in the first example an extra stage occurred between the normal stages IV and V, and this is verified by the changes in markings; for in those that had five stages, the markings changed in the fourth stage, while in this, the fourth stage was like the third and the change did not occur till the fifth stage.*

In the second example the fifth stage was abnormally large, so much so that the last four stages, in this case, present a good series with the ratio .77. and, judging from these stages only, it would certainly be inferred that the species had eight larval stages,† with the following series of widths of head:—calculated—.77, 1.0, 1.3, 1.7, 2.2, 2.8, 3.7, 4.8, mm., ratio .77. Compare with this the last four measurements of the second example.

The species of *Nadata*, then, present examples of variation in the number of larval stages, as well as an abnormal development.

It is probable that *Edema albicosta* acts in a similar, though less pro-

nounced manner.‡

The following descriptions apply to the species of *Nadata* that is common in the Yosemite Valley, Cal.

NADATA OREGONENSIS Butler.§

1881—Butler, Ann. and mag. nat. hist., p. 317.

behrensii Hy. Edwards.

1885—Hy. Edw., Ent. Amer., i, 49.

Egg. Rather more than hemispherical, the base flattened; smooth, not shiny, white with a yellowish tinge; diameter 1.2 mm. Under a microscope the surface is seen to be covered with very slight, obscure, rounded depressions, but, in fact, almost smooth.

Laid singly on the under side of the leaves of its food plants in early summer.

† The series of widths of head as observed by me for *Edema albicosta* were .40, .70, 1.30, 1.7, 2.3, 3.2, and I have twice attempted in the pages of *Psyche* to make them fit a series in regular geometrical progression, but without marked success. A series calculated with the ratio .55 would give—.41, .75, 1.27, 2.30, 4.3, and one with the ratio .73 or thereabout would interpolate a term between each one and give .41, .55, .75, .96, 1.27, 1.7, 2.3, 3.15, 4.3. Thus it might be considered either that the species normally had eight stages (ratio .73) and omitted the second and fourth normal stages, or that it had normally five stages (ratio .55), but interpolated a stage between the third and fourth normal stages, and reduced the measurement in the last stage to correspond with the ratio between those that immediately preceded it. The latter seems the more probable, but the fact is that the growth of the head at the first and second moults is double what it is at the third, fourth and fifth. It is a curious case.

§ This was described as a variety of *N. doubledayi* Pack.; but Mr. Butler writes me under date of June 30, 1892—"The types . . . have pale creamy buff-colored palpi; quite uniform in tint . . . if there is a brown line above it must be on the second joint, but I do not think there is one . . . looking at the moth without a lens you would say the fringe was dark ferruginous on primaries . . . and white tipped on interspaces." These are the characters used to separate *N. gibbosa* from *D. doubledayi* in Dr. Packard's description, and Mr. Butler's words show that his form is not a variety of *N. doubledayi*, but the same as Hy. Edwards' *N. behrensii*.

* In this connection I would like to call attention to my note on *Spilosoma latipennis* (Ent. news, v. 2, p. 115) where it will be seen an extra stage occurred between normal stages VIII and IX, not differing in markings from the stage before it, exactly as in the present instance. These cases are not analogous with such as are exhibited in *Orgyia* where an extra stage occurs in ♀ larvae, for the latter takes place to afford an increase in size. In the present instances the larvae with the extra stage are no larger than those with the normal number, and the stage is interpolated before the final stage instead of occurring after it.

† From similar measurements made in the case of *N. gibbosa*, I inferred that that species had more than six stages (see *Psyche*, v. 6, p. 147), but this inference is not justified by the facts. It will be found, however, to have occasionally as many as six stages.

Normal stage I. (First larval stage.) Head slightly bilobed, rounded, shining pale greenish with a few hairs; mouth brownish, ocelli black; width 0.75 mm. Body slender, no tubercles or humps, feet normal; smooth, shiny, pale yellowish green. Setae minute, rather long but not evident, color blackish. As the stage advances, great growth takes place, the color becomes green with a yellow subdorsal line much as in the mature larva. The body is transversely creased. Duration of this stage about four days.

Normal stage II. Not exhibited in any specimen seen by me and probably does not occur.

Normal stage III. (Second stage.) Head large, slightly bilobed, narrowing a little to vertex and flattened in front; pale green, hardly shiny; mouth white, ocelli and tips of jaws black; width 1.4-1.55 mm. Body slender, smooth, no perceptible hairs; legs normal; green, somewhat shiny, a broad yellowish green subdorsal line; spiracles black.

Normal stage IV. (Third stage.) Head as before; width 2.0-2.35 mm. Body slender, uniform green; a very distinct, rather broad, pale yellow, subdorsal band from joint 2 to the anal plate; spiracles black, faintly surrounded by yellowish. Scattered, very small and short setae.

Normal stage IV. (Fourth stage in some larvae.) Head large, flattened in front, very slightly bilobed, smooth, not shiny, pale green; ocelli black, labrum white, jaws black at tips, otherwise green; width 2.7-2.8 mm. Body transversely creased, leaf green with yellow piliferous dots bearing very small setae. A slightly darker dorsal line and broad yellow subdorsal line from joint 2 to the end of the anal plate. Spiracles black with small white centers.

Normal stage V. (Fourth or fifth stage.) Head shaped as before, pale green, not shiny, ocelli black on a white ground, labrum white at tip, jaws green tipped with black, antennae yellowish; width 3.2-3.7 mm. Body yellowish green with many yellow irregular ellip-

tical granulations and a distinct broad yellow subdorsal line, continuous from joint 2 to joint 13 and bordering the anal plate, which is rounded. Joint 2 is narrowly edged with yellow in front. Spiracles dark brown, paler centrally. Feet green, without any yellow spots.

Normal stage VI. (Fifth or sixth stage.) Head full, rounded, slightly shiny, and absolutely shagreened; partly retracted under joint 2; uniform leaf green, ocelli black on a white ground, mouth parts whitish, jaws straw yellow, tipped with black; clypeus small, triangular; width 4.6-4.8 mm. Body cylindrical, full and rounded, tapering slightly to the last segment which is smaller than the rest, leaf green or whitish green, densely covered with white, irregular, flattened elliptical granulations which on the venter become transverse streaks. In specimens in which the ground color is suffused with whitish, joint 2, joint 13 posteriorly and the anal feet remain leaf green. A broad, distinct, white subdorsal line, faint on the anterior part of joint 2. The anterior edge of joint 2 and the border of the anal plate, are bright yellow. Feet green, the abdominal ones covered with white granulations, and a white line before claspers. Spiracles orange red, faintly bordered with white. The edges of the white subdorsal band are not even but more or less incised, on the anterior segments being narrowly broken into contiguous elliptical areas, or in some specimens broken throughout the whole length.

Cocoon. The larvae enter the ground to pupate and form a rough cocoon of a few strong silken threads.

Pupa. Cylindrical, tapering, rather thick posteriorly to the thorax, the ends rounded, most so anteriorly; movable sutures of abdomen deep; cremaster long, rather thick, tapering and ending in two short divergent points. Body shiny, densely punctured; cases creased and also shiny. Color black with a shade of brown on the abdomen. Length 22 mm.; width 7 mm.

thick and solid, and covered by two or three layers of circular pieces of rose leaves.

MEGACHILE SCAEVUS Say.—I find in Dr. T. W. Harris MS. notes, in the library of the Boston Society of Natural History, the following notes on this species. "Nest under a stone Sept. 11, 1829. Imago, June and July."

MEGACHILE n. sp?.—Six cocoons were found in blackberry stems (probably received from Mr. James Angus) in tunnels just their size. They did not lie very near each other. They are quite tough and thick, and are rounded at one end and squarish at the other. Length .40; breadth .14 inch.

MEGACHILE BREVIS Say.—Its cells are like those of *M. centuncularis*, but the leaves of which they are made are more loosely placed around the cocoon. The leaves are neither those of the rose or spiraea, and were not identified. This is a small species, with the fore tibiae simple, as are those of *M. integer* Say. The nest, preserved in the Harris collection, is in the museum of the Boston Society of Natural History.

MEGACHILE INTEGER Say.—The nest, also in the Harris collection, is scarcely distinguishable from those of *M. centuncularis*, though the pieces may be a little larger, and the cells a little more flattened.

ENTOMOLOGICAL ITEMS.

Mr. T. D. A. Cockerell of Jamaica is engaged in an investigation upon the insects of Custer County, Colorado, with special reference to the origin of the successive faunas found at different altitudes, based upon his collections while resident there. It can hardly fail to give results of considerable general interest.

Out of fifty-seven specimens of *Opomala brachyptera* collected this season in New England by Mr. A. P. Morse, seven (2 ♂, 5 ♀) have tegmina and wings which extend to the tip of the hind femora, the ancestral form thus appearing to an unexpected degree;

of twenty-eight specimens in the collection of Mr. S. H. Scudder only one (a ♂) has wings of this length.

The U. S. National museum has recently published as a bulletin a pamphlet of about 150 pages, amply illustrated, containing admirable "Directions for collecting and preserving insects," by Dr. C. V. Riley; it is excellently planned and executed, with many sensible suggestions.

A successful visit was made last July by Messrs. S. H. and G. H. Scudder to the summits of the White Mountains to procure the eggs of *Oeneis semidea*. More than fifty females were captured, and about half of them sent to Mr. W. H. Edwards in West Virginia, the others placed over growing grass. More than half of those sent to West Virginia reached there alive and were there confined over growing plants, and from all many hundreds of eggs were obtained. Of one lot of over one hundred eggs laid in Cambridge, July 14, every one that was fertile hatched on July 26. The period may of course be longer on the mountain. Mr. G. H. Scudder found a caterpillar which had just reached the last stage feeding at midday on a blade of *Carex*, and it has since fed in Cambridge quite as much by day as by night.

The friends and admirers of the late Mr. Henry Walter Bates are endeavoring to raise a fund to be presented to his widow as a suitable memorial of their esteem. The first list embraced the names of nearly ninety persons, and £ 377 has been subscribed. Contributions may be sent to S. Wm. Silver, 3 York Gate, Regent's Park, N. W., London, England.

An admirable and interesting illustrated account of the life-history of *Hypoderma lineata*, the ox-bot of the United States, is given by Dr. C. V. Riley in the June number of insect life; Mr. Riley also contributes to the same number a highly important description and figure of the first larval stage of *Bruchus fabae*, showing that it has slender and rather long thoracic legs of a peculiar

pattern, lost with the first moult; and he has since pointed out that the same features are found in *Bruchus pisi*.

Late in August Mr. A. P. Morse took a black female of *Yasoniades glaucus* at Greenwich, Conn., the first known capture of this form in New England.

The first volume of Mr. W. F. Kirby's long promised Synonymic catalogue of moths, containing the Sphinges and Bombyces, has appeared. It makes a stout volume of 951 pages and is carried out in the same way as his catalogue of Butterflies. It will prove of much service.

Mr. Kirby has also issued a new edition of his Elementary text book of entomology, but beyond brief notes about some of the insects figured and the addition of an index, it scarcely differs from the first.

The eleventh part of Moore's Lepidoptera Indica leaves the work still confined to the Satyrinae; this part is almost entirely de-

voted to species of Debris and Lethe; besides the separation of wet and dry season forms in two species of Debris and the early stages of two species of Lethe there is little to interest the general reader; but it is full of geographical details, and contains, as usual, a complete summary of all that has been recorded of each species.

The closing pages of the second volume of Dr. Gundlach's Entomologia Cubana have just reached this country; they deal with the Orthoptera, from which we find that he credits Cuba with 146 species, divided as follows: Forficulidae, 8; Blattidae, 42; Mantidae, 8; Phasmidae, 14; Acrididae, 20; Locustidae, 23; Gryllidae, 31. How different the proportional numbers are from what would be found in any state of the Union, even Florida!

On p. 292 of the July number of *Psyche*, in line 15 of the table, for "indistinct" read "distinct."

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PSYCHE.

SOME OLD CORRESPONDENCE BETWEEN HARRIS, SAY AND PICKERING.—VII.

[PICKERING TO SAY.]

SALEM, Nov. 14, 1825.

Dear Sir,

I received your letter, dated Oct. 12th, by mail in due season: of that white *Pieris* I have but a single specimen which is, I believe, a male, though it is so much injured that I will not be certain about it; it does not apparently differ from that which I sent you which is as good a specimen as could be procured; as the species occurred frequently and within a short distance I most probably saw both sexes, and if there were any difference between them, at all conspicuous, I should have observed it: my attention was so much distracted by botany during my short visit to the White hills that I neglected the insects more than I ought to have done—and besides my whole collection of minute insects was lost, so that I did not bring home above a hundred species. Of these I will mention a few trusting that you will excuse me, if they prove to be familiar to you, as my opportunities of becoming acquainted with American insects are at present very limited, amounting principally to Turton's *Linnaeus*. I expect however to get access to your publications this Winter.

A species of *Nothiophilus* (not distinguishable by a short description from

N. aquaticus of Europe) occurred on the bald part of the mountains to the very apex of Mount Washington. At the same locality I took a *Thanasimus*, differing from the description of *T. formicarius* in having the anterior fourth of the thorax black—its length is a little over a fifth of an inch.



1. The perfect insect, line above natural size. 2. The hind tarsus. 3. Last joint of the tarsus. 4. Front view of the head. 5. Elyt.

On the road through the Notch I found a *Cimbex*—length of the body nearly one inch, tergum black-blue with a yellow spot on each side of the 5, 6, and 7 segments, wings fuscous at the middle and tip, it is a female.

The insect of which I send you a sketch* I am unable to refer to any genus I can find described; it belongs to the family *Cantharidae*; it differs from *Lytta* in having the head gradually tapering behind the eyes into an indistinct

*[Determined by Mr. Samuel Henshaw as *Cephaloon unguiculare* Lec.]

neck, and narrower than the thorax; the description of the antennae of *Zonitis* does not apply as you will see; and the elytra are not abruptly attenuated as in *Apalus* (with the habit of the two last genera I am unacquainted); the outer division of the nails serrated beneath; a single specimen was taken on flowers of the *Heracleum lanatum* on the sides of the White M.

If any of these prove new to you I will send you drawings in the Spring. My collection of insects is not at present very extensive amounting to not above 1500 species collected by myself in this vicinity. Of those insects described by you in the appendix of Major Long's 2nd expedition I have the following, *Cistela sericea*, *Spectrum femoratum* (my specimen is also a male), *Chauliodes serricornis*, *Dolerus inornatus*, *D. arvensis*, *Fœnus tarsatorius*, *Sigalphus*

sericeus, *Chalcis microgaster*, *Tiphia inornata*, *Pompilus fascipennis*, *Ceropales bipunctata*, *Eumenes fraterna*. Mr. Little of Boston has taken two or three specimens of your *Clytus speciosus* near that place, and Mr. Oakes of Danvers has also taken a specimen.

Under the bark of rotten pine stumps I have several times met with the molluscous animal which I have sketched—in its living state it seems to differ from *Limax* in the complete destitution of a shield, but in specimens preserved in spirits it is seen that the shield covers the whole of the upper part of the body taking the place that the cloak usually does? It does not agree with any of the subgenera of Cuvier. I should like to know whether you are acquainted with this animal in Philadelphia.

Yours,

CHARLES PICKERING.

A MERITED HONOR.

Rarely in these times do the great universities of the world confer their highest honors upon students of the natural sciences; far more rarely has it been that such honors have been conferred upon those whose merits have been won by investigations in systematic entomology. The more noteworthy, hence, is the bestowal, recently, by the University of Heidelberg, of the honorary degree of Doctor of Natural Science, on Baron C. R. v. Osten Sacken—"qui de scientia entomologica excolenda, novisque rationibus illustranda optime meruit." The honor was all the greater because it required the unanimous approval of the Faculty conferring it. It is an honor well deserved, and none will rejoice over it more than the American entomologists, and especially the American dipterologists.

Baron Osten Sacken's work has been chiefly related to American dipterology, but the ripe fruits of his wide experience, and broad grasp of principles have enriched all dipterology, and, I believe, all entomology. Others there are and have been who have won enviable honors in systematic dipterology; others who have written more extensively than he, but no one has written more that will be appreciated in the future than has Baron Osten Sacken. His work has not been free from error, for that is impossible, but it has always been conscientious and rich with suggestions. However radically one may differ from him in certain of his views, their cogency will not be questioned.

Baron Osten Sacken's health has not been good for some years past, but his friends will rejoice that it has of late improved, and will hope for many papers from his pen yet to appear.

S. W. Williston.

(Continued from page 336).

This species so far as known is confined to the northern half of the United States in the general vicinity of the Rocky Mountains. Specimens before me come from the upper Missouri and Yellowstone (F. V. Hayden), explorations in Dakota under Gen. Sully (S. M. Rothhammer), Nevada (H. Edwards), Utah (P. R. Uhler), about Rangeley on the lower White River, western Colorado (S. H. Scudder), Colorado, 5500', probably at the eastern edge of the foot-hills (H. K. Morrison, in S. Henshaw's coll. and my own), and Yuma, Arizona, collected by Wickham (Bruner).

I have seen but two specimens with red hind wings, both females from Rangeley, Colorado.

HIPPISCUS (X.) TOLTECUS.

Xanthippus toltectus Sauss., Prodr. Oedip., 91-92.

If I have correctly identified Saussure's species it has a wide range. He records it from Mexico alta. I have seen specimens from Spring Lake Villa, Utah Co., Utah, Aug. 1-4 (E. Palmer), Helena, Montana, June 21 (A. S. Packard), and Laramie River, Wyoming, (L. Bruner.)

HIPPISCUS (X.) ALTIVOLUS sp. nov.

Dark obscure brownish fuscous, not very robust and of small size. Head dull dirty cinereous with numerous more or less clustered blackish points, most abundant above;

summit relatively broad, scarcely at all tumid, subrugulose, the vertical fastigium indistinct from the low and dull bounding walls, closed behind by the arcuate incurving of the lateral walls, separated distinctly from the tolerably deep, biareolate median foveola; lateral foveolae rather small, triangular, subequiangular; frontal costa of moderate breadth, fading and not expanding below, but little contracted at summit, broadly and shallowly sulcate throughout. Prothorax but slightly expanding on the metazona, the dorsal area plane, scarcely indented at the front margin of the metazona, sparsely verrucose and in addition abundantly but bluntly and obscurely arenaceous; process rectangulate; median carina low, subequal, not arched; lateral carinae tolerably pronounced; lateral lobes bluntly subrugulose on the metazona, marked with a large subquadrate blackish spot on the prozona. Tegmina very short, extending when at rest but little beyond the hind femora, dirty cinereous with obscure dark brownish fuscous transverse more or less blended bands, broader than the intermediate ashen ground, and therefore occupying much the larger space even on the apical half which is scarcely at all vitreous; sutural stripe obscure testaceous. Wings pale dull citron at base with similar reticulation, subvitreous apically with black reticulation and between a strongly arcuate, moderately narrow, blackish fuliginous band which narrows in passing toward the anal angle, which it fails to reach, and does not narrow above; it lies entirely in the apical half of the wing, leaves four marginal lobes free, and appears not to be at all separated from the humeral vitta whose outer limit is in oblique continuation of its outer curve and which reaches almost to the base; the basal half of the costal margin is testaceous. Hind femora brownish cinereous externally, with rather obscure oblique brownish stripes, the inferior surface dull coral red like the tibiae which are more or

less pallid on the sides and basally above; spines black tipped.

Length of body, 32.5 mm.; of tegmina, 20 mm.

Described from 1 ♀.

After describing the above female I received a male through the kindness of Mr. Bruner which differs from the female in general appearance much as do the males from the females in *H. (X.) Pumilus*. I may add that the lighter markings of the tegmina are slightly more distinct and better defined and the fuscous band of the wings (which are pale red at the base) is decidedly broader than in the ♀ and is re-enforced by quadrate cellular fuscous spots in the otherwise hyaline apex.

Length of body, 20 mm.; of tegmina, 19 mm.

Taken by me on the side of Mt. Lincoln, Colorado, above timber, between 11000-13000' above sea-level, Aug. 13, and by Mr. Bruner at Como, Colorado, (about 9500') July 16. It appears therefore to be an alpine form.

HIPPISCUS (X.) CUPIDUS sp. nov.

Similar to the last but a much larger species and of a robust form. Dark cinereous-fuscous. Head cinereous on the cheeks, blackish fuscous above and to a considerable extent in front, especially on the sides of the frontal costa; summit broad, slightly tumid, longitudinally rugulose, the vertical fastigium hexagonal with distinct and somewhat prominent lateral walls, partially closed with lower walls behind, with a median carina in its posterior half (which extends over the summit), more deeply impressed on its anterior than on its posterior half, but

partially open to the subquadrate biareolate median foveola; lateral foveolae small, distinct, triangular; frontal costa broad, rather deeply sulcate throughout, but little contracted above and hardly more than below the ocellus, widely expanding at the base and not there evanescent; antennae blackish, paling at the base. Prothorax stout and massive, the prozona distinctly tectiform but tumid, the metazona plane but longitudinally a little arcuate and centrally tumid, rather deeply impressed at the principal sulcus, the whole dorsal surface verrucose and briefly and longitudinally rugulose, but nowhere crowded with elevations; median carina moderately high and more or less arched in each of its divisions, greatly subdued between the sulci; lateral carinae distinct and rather sharp, particularly at the principal sulcus; lateral lobes bluntly verruculose, especially on the metazona, with a large, median, glabrous, subquadrate black patch having a quadrate cinereous patch in the lower posterior quadrant; process of metazona rectangulate. Tegmina only reaching as far as the hind femora. stout, blackish fuscous, paling a little distally, with distinct, small, bright cinereous, triangular markings, besides cinereous stripes along the lines of the principal nearly attingent veins, all having the same effect as the pantherine markings common in this group. Wings pale citron at base with similar reticulation and along the basal half of the front margin, vitreous apically with black reticulation and more or less fuliginous at tip, with a strongly arcuate, median, fuliginous band moderately far from the margin and separated only by a citron vein from the humeral vitta, which is in oblique continuation of its outer limit, and extends to the base of the wing, a blackish marginal stigma at its outer limit. Hind femora very broad with high carinae, cinereous with three strongly oblique blackish bars narrowest and darkest below, very broad above, the inner and inferior surface coral red; tibiae dull coral red, more or less infuscated on the

sides with cinereous carinae; spines black tipped.

Length of body, 37 mm.; of tegmina, 25 mm.

Described from 1 ♀ in the collection of Mr. Lawrence Bruner, taken on the Pinal Mountains of Arizona. It is apparently an alpine form.

HIPPISCUS (X.) PUMILUS sp. nov.

Very dark brown with generally slight cinereous shades, of rather a slender form (the ♀ more robust) and of a small size. Head tolerably tumid and moderately broad above, very variable in abundance and prominence of rugosities, but which are never very pronounced; darkest above, the face and cheeks often pallid cinereous flecked with fuscous, sometimes collected into short oblique stripes on the posterior part of the head; vertex of fastigium distinct and plane with sharp but low bounding walls, broader in ♀ than in ♂ where it is usually longer than broad, rarely closed behind, the lateral walls usually regularly arcuate with a slight tendency to a median angle; median carina generally terminating in the middle of the fastigium; lateral foveolae subtriangular, considerably longer than broad, rather shallow; median foveola variable, sometimes obsolete, sometimes biareolate and distinct from vertical fastigium only by being at a lower level; frontal costa moderately narrow, narrowed at summit, sulcate, sometimes through its whole extent and then continuous with and suppressing the median foveola, sometimes not affecting the summit, the lower portion expanding more or less and finally obsolete. Antennae shorter than (♀), or more than half as long again as (♂) the head and prothorax together, luteo-fuscous at base, blackish fuscous beyond, distinctly tapering only in the last three or four joints in the ♀, in at least the latter fifth and cochleate in the ♂.

Prothorax compressed and expanding very slightly in the ♂, robust and expanding considerably in the ♀, the prozona subectiform, the metazona plane and in the ♀ a little tumid centrally, with scattered slight, short, linear verrucosities inclined in various directions and besides but few granulations; a broad bent pallid or cinereous band on either side, often obsolete; median carina slight and equal; lateral carinae distinct and rather sharp but not prominent; upper portion of lateral lobes of prozona black or blackish with a superior oblique pallid dash and a median posterior quadrate pallid spot. Tegmina blackish brown with pale cinereous markings often almost wholly obliterated except some slight spots and streaks along the costal margin and a narrow transverse stripe crossing the base of the outer discoidal area; generally also with a triangular patch depending from the costal margin and extending, sometimes interrupted, across the middle of the inner discoidal area, with another slender stripe midway between this and the outer stripe and connected with the latter by a stripe following the base of the anterior ulnar nervule; but sometimes increased in extent and in number by multiplication of other, sometimes sinuous, transverse stripes, especially in the apical half and in the upper portion of the extreme base so that the ground is about equally divided between the two colors and the markings assume somewhat the distribution which prevails in *H. (X.) affictus*; there is a broad conspicuous bright flavous sutural stripe and the brown axillary field is usually immaculate. Wings very pale citron or salmon red at base with corresponding reticulation, vitreous apically, the extreme apex sometimes maculate, with black reticulation and a fuliginous median arcuate band, which is generally fainter and narrower in the ♀ than in the ♂, where it is sometimes blackish fuliginous, and varies from a width hardly equal to more than one of the interspaces (when it may escape the border altogether) to a broad band more

or less confused with the more or less fuliginous maculate apex, and when not so confused generally leaving three or four marginal lobes free; it is separated distinctly by a pale yellow line from the humeral vitta which extends from its outer margin almost or quite to the base, leaving on the basal half of the costal margin a yellowish line. Hind femora more or less pallid, lighter or darker cinereous externally, traversed by three strongly oblique blackish bands, within coral red blotched heavily with black, beneath like the tibiae coral red, the outer side of the latter more or less pallid, the spines black tipped; but the brighter colors may vary all the way from coral red to luteous.

Length of body, ♂, 18-24.5 mm., ♀, 26.5-35 mm.; of tegmina ♂, 17-23 mm., ♀, 20-26 mm.

Described from 51 ♂, 5 ♀.

This is mainly a Coloradan species taken at the height of 8-9000' (Morrison in S. Henshaw's, L. Bruner's collections and my own), at Florissant, (June, S. H. Scudder; June 13-15, R. Thaxter), and South Park, 8-9000' (June 16-23, R. Thaxter). Bruner, however, sends me also specimens from Taos Valley, N. Mex., and says it also occurs at Ft. Grant, Arizona.

Only one specimen, a ♀ from South Park, has red wings.

HIPPISCUS (X.) ALBULUS sp. nov.

Fusco-cinereous, of moderately robust form and small size. Head pretty large and tumid, especially in the ♀, cinereous, infuscated above and marked interruptedly with small blackish brown spots on all prominences below the eyes including a narrow oblique stripe across the cheeks; summit of head faintly rugulose with faint divergent shallow

sulcations extending backward from the posterior limit of the fastigium of the vertex; this deeply hollowed, with high and thin bounding walls, open behind, and in front scarcely separated from the deep, faintly biareolate, not very broad, median foveola; median carina slight, reaching the middle of the fastigium; lateral foveolae triangular, rather pronounced; frontal costa of moderate breadth, strongly contracted at summit and less so below the ocellus, sulcate throughout. Pronotum compact, considerably expanded on the metazona, rather sparsely and moderately verruculose and also rather faintly arenaceous, the metazona plane, the process rather less than rectangular, the median carina rather slight, nearly straight, obsolete between the sulci and here accompanied by a distinct discal scutellum, the lateral carinae stout, heavy, distinct, and extended; sides of dorsum with diverging pallid bands in the ♂; lateral lobes of pronotum pallid or cinereous, heavily blotched with black. Tegmina with distinctly pantherine markings made up about equally of dark brown and pallid cinereous colors, the former prevailing and blending on the posterior, the latter on the anterior half of the tegmina; they are mostly transverse, but a single oblique small brown bar in the middle of the tegmina in an otherwise broad pallid patch lies at the base of the outer discoidal field; the sutural stripe is pallid cinereous. Wings pallid, perhaps in life pale citron at base with corresponding reticulation, pellucid apically with black reticulation, the ♂ with a slight trace of extreme apical infuscation, the space between, wholly in the apical half of the wing, with a narrow, strongly arcuate, more or less distinct, fuliginous band, tapering along the outer margin and not nearly reaching the anal angle, narrowing also to some extent above, in the ♀ obsolescent, and leaving only about three marginal lobes free; it is separated by a clear line from the humeral vitta which, though it reaches nearly to the base, extends outward hardly beyond the inner limit of the

PREPARATORY STAGES OF PHEOSIA PORTLANDIA Hy. Edw.

BY HARRISON G. DYAR, BOSTON, MASS.

PHEOSIA PORTLANDIA Edwards.

1886. — Hy. Edw., Ent. amer., ii, 168,

Pheosia.

1891. — Smith, List lep., No. 1237.

descherei Neumögen.1892. — Neum., Can. ent., xxiv, 227, *Noto-donta*.

Egg. — Hemispherical, the base flat; not shining, whitish green; diameter 1.2 mm. Under the microscope it appears densely covered with minute white granulations, except at the micropyle, where is a single larger granulation, surrounded by a pale green ring, from which the granulations are absent. The granulations are larger in the area immediately around the micropyle, and diminish in size towards the base of the egg, becoming very minute and almost lost on the under side. The larva hatches by eating a semicircular hole in the side of the egg, leaving the rest of the shell. Eggs laid singly on the leaves.

First stage. — Head slightly bilobed, black and shining; labrum paler, slightly whitish; a few pale hairs; width 0.65 mm. Joint 12 is hardly perceptibly enlarged dorsally; body cylindrical, diminishing a little in size posteriorly; no traces of a caudal horn; feet normal, the anal pair used in walking. Color pale white, cervical shield and thoracic feet black, abdominal feet, except the last pair, blackish outwardly; setiferous dots concolorous, the setae pale, short. As the stage advances the anal plate, all the abdominal feet outwardly and the piliferous dots become black. The dots are large and distinct, row 1 on joints 5-12 almost in line with row 2 except that on joint 12 there is a single large dorsal dot instead of row 1 but it bears two setae; row 3 lateral; rows 4 and 5 subventral, smaller. Joint 12 becomes more enlarged,

but there is still no horn, till just at the end of the stage a purplish shade appears about the dorsal dot. A row of subventral purplish spots appears and the body becomes greenish.

Second stage. — Head hardly bilobed, rounded, narrowing a little to vertex; smooth shining pale brownish, vertices of lobes nearly black, labrum whitish, jaws and ocelli black; width 1.0 mm. Body slender, cylindrical, with a short, rounded, conical process on joint 12 dorsally, bearing the two setae of row 1 almost at its vertex; other setae fine, blackish, situated as before, their bases very slightly elevated but not discolored. Body pale whitish green, thoracic feet blackish with a dark red subventral line along their bases, represented by small spots above the abdominal feet. Process on joint 12 faintly purplish. Cervical shield and anal plate not distinguishable. Later a yellowish shade appears substigmatically, the subventral band below it is purplish, broken, occurring on the bases of the legs. Abdominal feet green, tinged with purplish on the outside.

Third stage. — Head rounded, and narrowing a little above, very slightly bilobed, flattened in front so that the lateral outline is nearly triangular; straw yellow, not shining, ocelli and jaws inwardly brown, labrum whitish; width 1.6 mm. Body cylindrical, joint 12 enlarged and bearing a fleshy process in the shape of a horn, 0.4 mm. long and directed straight upward. Setae short, pale, row 1 on joint 12 diverging from the horn before its tip, their concolorous bases slightly elevated and, under a lens, with a minute black dot. Color uniform pale green, yellowish at the sides with an interrupted purplish red band along the bases of the legs, most well developed on the thoracic segments. Spiracles black, narrowly paler

centrally. Feet pale, purplish tinged outwardly; horn reddish. Later the spiracles are surrounded by whitish, outside which is a faint purplish space, which on joint 3 extends over the dorsum. Horn 0.8 mm. long. At the end of the stage, the purplish shading overspreads the whole lateral region, but is sharply defined above subdorsally, leaving the dorsum broadly green. Joint 2 is all green, as is the venter between the legs. A faint line reaches straight up from the spiracle on joint 12 to the horn.

Fourth stage.—Head shaped as before, yellowish green, slightly mottled with brown on the sides of the front; ocelli brown, jaws brownish, antennae reddish, labrum whitish; width 2.4 mm. Body slender, joint 12 enlarged, with a thick, conical, fleshy horn from a very large base, rounded at the tip, pointing straight up and bearing two minute divergent setae; length about 1 mm. The setae on the body arise from small, concolorous, rounded, shining warts, row 3 rather conspicuous, the rest minute. Dorsum broadly bright green, except on joints 2 and 3, where it is shaded with purplish brown in a dorsal line extending over joint 3 laterally. Lateral region, subdorsal to substigmatal, shaded with purplish, bordered below by a heavier shade and emphasized on the bases of all the feet, except the anal, by a nearly black shade. Feet purplish; venter green; horn purplish brown with a line running down to the spiracle. Spiracles black, white centrally and surrounded by a broad white ring, except the one on joint 2. Anal plate large, green, but quite smooth and inconspicuous. Later, a livid purplish tint spreads slightly over the body, and there is less contrast between the dorsal and lateral regions. The horn is 2 mm. long, and is colored livid purplish with a dark purple brown stripe down the side, running behind the spiracle.

Fifth stage.—Head shaped as before; green, but covered with a brown shade except over the clypeus and a space immedi-

ately around it, densely mottled with green spots; jaws brownish, ocelli minute, black, labrum pale; width 3.9 mm. Body smooth, setae very minute, joint 12 much enlarged, the horn very well developed, becoming 3 mm. long and thick at base; anal plate large, nearly circular, excavated anteriorly, coarsely granular with a knob-like prominence in the center. Body at first nearly green, but overspread with a livid purplish shade, a band over joint 3, lines on the feet on joints 7-10 and a stripe from vertex of horn to subventral region purplish black. Bases of horn before and behind the black stripe, pinkish. Anal plate green with reddish border. Thoracic feet reddish. Spiracles white in a narrow black border, surrounded by white and outside this by a purplish black ring. Abdominal feet red each side of the black line. As the stage advances, the head and body become shining, light, livid, greenish purple, marked as before; venter centrally green; anal plate entirely reddish, deep red on the circumference. The black stripes become paler, the spiracles entirely black inside of their white border. Still later a diffuse, but evident, ochre yellow substigmatal line appears, ending abruptly on the lower side in a greenish shade, reaching up above half-way on the spiracles. The purple color of the body is very pale and becomes more and more livid and greenish. Length of larva 50 mm.

Cocoon.—The larva went just beneath the surface of the ground and formed a cell lined with silk.

Pupa.—Cylindrical, rounded at both ends, thickest through the 4th abdominal segment. Cases comparatively small, wrinkled; cremaster, two short thick spines, some distance apart which point outwardly at an angle from the body. Color very dark brown, black on the cases and the back. Length 21 mm.; width 7 mm.

Food plant.—Willow (*Salix*).

Larvae from Portland, Oregon.

The moths differ from *Pheosia dimidiata*

H.-S. in that the fore wings are much darker. The male has no white markings except the apical streak, and the transverse lines, usual in the Notodontidae, can be seen faintly crossing the wing, while in *P. dimidiata* they are quite obsolete except at the internal margin. T. a. line very faint, defined by the inner edge of the black cellular patch, obso-

lete below median vein, but below submedian fold very distinct, white, sharply produced inward and bordering the fawn colored patch. T. p. line from costa along discal cross vein, either straight or sharply dentate on the veins, lost between veins 2 and 3, but distinct on internal margin in a short white dash, reaching internal vein.

OVIPOSITION OF A HOMOPTEROUS INSECT IN YUCCA.

BY C. H. TYLER TOWNSEND, LAS CRUCES, N. MEX.

On May 15, 1891, a grayish homopterous insect, one of the Fulgoridae, or lantern-flies, was found very numerous on leaves of *Yucca angustifolia*. It was also found on *Y. macrocarpa* (?)*. Specimens are determined by Dr. Uhler as *Oecleus decens* Stål.

At the same date on which the insects were found, it was noticed that the leaves of *Y. angustifolia* were largely covered with very small patches of a pure white, woolly or cottony, fluffy material, arranged in more or less irregular rows. They were found to be punctures consisting of slightly raised swellings of the surface of the leaf, each swelling being marked by this cottony covering. They exhibited much the general appearance, at first sight, of colonies of a small white cottony scale. These are the egg-punctures. They are always placed on the upper side of the leaf, and usually, if not always, near the tip or point. Superficial examination shows only this woolly, snow-white, fluffy substance, apparently containing nothing, but covering the slightly raised puncture in the leaf. The above fulgorid was found wherever this woolly material occurred, usually on and about it, and consequently raised the question in my mind of some connection between the two.

On May 21, the punctures were carefully examined and found to contain eggs. The

egg measures $\frac{1}{8}$ mm. in length, by $\frac{1}{4}$ mm. in width. Examination on May 15 had disclosed no eggs whatever, and I imagine that they were not yet all deposited at that date. The presence of the insects would perhaps indicate that they were in the act of ovipositing and preparing the leaves for the reception of the eggs. The leaves of *Y. macrocarpa* (?) contained, at that date, no punctures. Though I have not at any time observed the insects making these punctures, I still feel confident that the latter belong to this fulgorid, since there is no other insect frequenting the Yuccas that could make them. I may add that I have found the abdominal saws or pincers of a female specimen with some of the same white fluffy substance still adhering to them.

On May 31, plants of *Yucca angustifolia* were found to be thickly oviposited in. Some plants had the tips of nearly every leaf covered with the white fluffy material. Numbers of this insect were present, many of them on the punctured portions.

On June 2, similar egg punctures were found on the leaves of *Yucca macrocarpa* (?) marked by the same woolly material. Three specimens of an *Oecleus*, which Dr. Uhler says is the same as *O. decens*, were found clustered on the woolly punctures. They were, however, decidedly smaller than those previously found, and which had occurred only on *Y. angustifolia*. I was inclined to

* This species may be *Y. baccata*.

consider them a distinct species, since they were of uniform size among themselves. Only one specimen of this smaller kind had been found before this date, but it was taken, May 30, on an isolated plant of *T. angustifolia*, alone and solitary. I will therefore not attempt to prove any distinction between the two forms, which may be only the two sexes of the same species, and apparently are from an examination of the genitalia.

The punctures are sometimes placed in rows, but usually only when near the tips of the narrow leaves of *T. angustifolia*. They are most often massed together over the whole upper distal surface of the leaf, and are always placed very closely together. Each patch or tuft of the cottony substance which marks a puncture is usually from $\frac{1}{4}$ mm. to 1 mm. in diameter, and about $\frac{3}{4}$ mm. thick or slightly more.

This white, fluffy material is extremely

fine in texture, and I was at first inclined to believe that it was simply the natural very fine and silken fiber of the Yucca leaf, carded out by the ovipositor of the female Oecleus. Were this so, it would be quite interesting as exhibiting in a state of nature the beautiful, delicate, silken fiber which these plants are capable of yielding. I believe, however, that it is a juice, either from the leaf or from the insect, probably the former, which hardens on exposure to the air. It is seemingly soluble in water, and is probably only the hardened sap of the Yucca leaf.

In conclusion, it might be said that the constant watchfulness with which the Oecleus seems to attend upon and frequent the vicinity of its egg-punctures, even after the eggs have for days been deposited, is suggestive of a motherly instinct and seems a manifestation of parental care in the hatching of the young.

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PSYCHE.

SOME OLD CORRESPONDENCE BETWEEN HARRIS, SAY AND PICKERING.—VIII.

[HARRIS TO SAY.]

CAMBRIDGE, MASS. March 21, 1834.
To THOS. SAY ESQ.

Dear Sir,

On the 27th November I wrote to give you information that my long-promised collection of insects was shipped in a large case, in the *Tarquin* from Boston for New-Orleans. I have since received a receipt for the same from Mr. Jos. Barabino, dated N. O. January 15th, enclosed in a letter from my friend Vose, who tells me that Mr. B. will pay every necessary attention in forwarding the collection safely to you; & I therefore presume that you must, long before this, have received it. As it is possible that my letter may not have reached you I shall repeat, what I therein stated, that a succession of domestic afflictions prevented me from complying with my promise to you until November last, but that my love for Entomology still remains, & with it an increased desire to obtain your kind assistance in determining many of the insects sent to you. Of the collection (consisting in all of 1970 specimens, or about 1800 species,)

1202 insects are for yourself; the remainder, being *uniques* from my cabinet, you will please to return as soon after examining them as you can. I hope you will let the numbers remain attached to all of these insects for the present, even to those which are for yourself; & I must beg you, in particular, to keep the *uniques* in the boxes in which they are sent during the time you may find it necessary to retain them. Red tickets are attached to a number of insects, which were presented to me by Mr. J. W. Randall, (a student in the University, who has a good collection of native insects of this vicinity,) & who is desirous of describing them if new. In the *Mss* catalogue I have endeavoured to give the specific names of the *first* describers, whenever known to me, notwithstanding that they might be less commonly received than other names. The same has been done in the printed catalogue, made out about two years ago for Prof. Hitchcock, & printed last autumn almost without alteration or correction. This brings me to the present object of my letter, which is to solicit your immediate at-

tention to the collection, with a view to enable me to revise, correct, & enlarge the catalogue of insects attached to Prof. Hitchcock's "Survey of Massachusetts", of which he has just informed me a new edition will be issued in the course of 2 or 3 months. Do not, I beg you, disappoint me in this matter, for I know that the catalogue is very imperfect, & in many instances may be incorrect. Typographical errors you will discover in it; for these however I am not answerable; but, for the credit of American Science, I do hope that you will help me to give a better & longer list of the insects of Massachusetts, which the collection sent to you will undoubtedly enable you to do. In the case is a blank catalogue, prepared with numbers corresponding to the insects themselves, & to the Mss catalogue, in order to save you some trouble & to obviate mistakes & omissions; & ample space is left in it for any remarks you may be willing to add to the names. As fast as you fill up the sheets of this catalogue please enclose them in an envelope & forward them to me by mail. In cases where you entirely agree with me in the name you can, if you prefer, merely write *yes* against the numbers:—where I have expressed a doubt (?), if the name nevertheless be right, you may say *yes with't doubt*; in all other cases I rely upon the information you may give alone, having hitherto been unable to ascertain the names, or having merely given names myself to supposed nondescripts.

I believe that I have already thanked you for the specimens of *Cremastocheilus* you sent to me—two of them came unbroken, but the others were injured by the crushing of the little bit of wood in which they were enclosed; still I was enabled from the fragments to ascertain that one of them was a new species. The description with figures of these insects ought to have appeared long ago; but the Boston Society of Natural History has delayed publishing until this spring, not for the want of matter, but from a desire of increasing their cabinet, library, & other means, before undertaking so serious a project as the publication of a Scientific Journal. The first number, however, is now in press, & the 2d, which is to contain my paper, will soon follow, & will be forwarded to you.

With the insects sent to you I also sent a few shells, the papers containing which were numbered. Of these you will take note, &, at your entire leisure, I shall be glad to have you give me the names corresponding to these numbers.

And now, my dear Sir, I have imposed upon your friendship & your love of science a heavy task—but how could I help it? I only wish that it were in my power to do something for you in return. In the hope, whatever may have been my *apparent* delinquency, that you will now fully exonerate me from wilful negligence, & will favor me with a speedy reply, I subscribe myself

Your friend & serv't

T. WM. HARRIS.

(Concluded from page 350.)

arcuate band, the more or less pallid costal margin faintly infuscated next the outer limit of the vitta. Hind femora with the inferior carina strongly arcuate, the outer face pallid, more or less strongly marked with three broad, oblique, blackish bands, beneath like the tibiae and tarsi, very pale luteous, the spines black tipped.

Length of body, ♂, 22 mm., ♀, 28 mm.; of tegmina, ♂, 24 mm., ♀, 26 mm.

Described from 1 ♂, 1 ♀, taken in the Prescott Mountain District, central Arizona, by Dr. Edward Palmer.

HIPPISCUS (X.) LATEFASCIATUS sp. nov.

Very dark brownish fuscous, marked with cinereous, of a moderately robust form (the ♂ rather slender) and rather below the medium size. Head sparsely and slightly rugulose above, not very broad, the fastigium of the vertex plane with rather low bounding walls, open behind, and in front completely engulfing the faintly biareolate median foveola, the lateral foveolae distinct, triangular, rather small, the frontal costa of moderate breadth, sulcate throughout except at the contracted summit. Pronotum very dark, the dorsum sometimes with subdecussate, broad, cinereous markings, the lateral lobes more tinged with gray, but with a large central quadrangular black patch on prozona; dorsum of ♂ nearly plane, of ♀ somewhat tumid, of both rather strongly and coarsely verruculose, the more prominent elevations longitudinal but short; median carina obsolete between the sulci (but here accompanied by only an obsolete discal scutellum) nowhere prominent except where it passes, in the ♀. over the stabbed front of the metazona; process rectangulate; lateral carinae prominent, rather sharp, and extended. Tegmina pantherine, cinereous, and dark brown, the darker markings prevailing, ex-

tending to the apex, crossing almost or quite the whole wing, and everywhere very much broken, hardly more blended at the base than elsewhere; sutural stripe cinereous. Wings pale citron at base with corresponding reticulation, pellucid with black reticulation and a few cellular maculations at apex, and between an unusually broad, arcuate, blackish fuliginous band which narrows only when following the outer margin to the anal angle, which it reaches and leaves in the ♂ only a little more than two, in the ♀ three or four marginal lobes free at the apex; it is separated by a fine fulvous line from the humeral vitta, the outer limit of which corresponds to that of the arcuate band and extends nearly or quite to the base, leaving only the basal half of the costal edge light colored. Hind femora externally pale cinereous with three broad, very oblique, blackish bands, internally coral red blotched with blackish at the base, beneath, like the tibiae, coral red, the latter more or less hoary externally on the basal half, the spines black tipped.

Length of body, ♂, 23-25 mm., ♀, 33.5-37 mm.; tegmina, ♂, 25-27 mm., ♀, 31.5-36 mm.

Described from 4 ♂, 2 ♀.

This is a northern species, living next our northern boundary, occurring from the Red River in Manitoba (Donald Gunn) and Calgary, Alberta, British Columbia, June 11 (Bean in S. Henshaw's collection) to the upper Missouri and Yellowstone (F. V. Hayden).

HIPPISCUS (X.) OBSCURUS sp. nov.

Blackish fuscous, of slender form and small size. Head dark only on summit, being elsewhere cinereous or livid, flecked with fuscous dots, not very large nor very tumid, faintly subrugulose in the vicinity of the

posterior margin of the fastigium of the vertex; this distinct, plane, as broad as long, open behind, closed by a V-shaped carina in front, the walls low but distinct and in the middle angulate; median carina when present terminating in the middle of the fastigium; lateral foveolae very distinct, elongate triangular, including between their tips the equally deep biareolate foveola, which in the ♀ is sometimes confluent with the sulcus of the frontal costa; the latter moderately broad, subequal, but slightly contracted at summit, more or less sulcate throughout, above with a slight median carina. Pronotum compressed, but little expanded on the metazona, plane above, the process of metazona rectangulate, the median carina slight, equal, straight, uninterrupted between the sulci, the lateral carinae slight and confined to the metazona, the dorsal surface longitudinally rugulose with short vermiculations, more crowded, transverse, and subdued on the lateral lobes of the metazona. Tegmina dark brownish fuscous marked with dark cinereous after the fashion of *H. (X.) neglectus* and as there somewhat variable, the sutural stripe hardly visible. Wings pale citron on basal half with corresponding reticulation (except where the humeral vitta runs in nearly to the base), blackish fuliginous beyond, the apex of the two uppermost lobes generally more or less vitreous with black reticulation, at the most occupying a triangular area which takes in less than a fourth of the costal margin, and is then generally abridged by the infuscation or infumation of the extreme apex. Hind femora dark grayish cinereous externally, crossed obliquely by three obscure, moderately narrow, dark fuscous stripes, internally black with apical and postmedian transverse luteous stripes, inferiorly luteous often with a reddish tinge; hind tibiae rather pale coral red, apically often becoming luteous, the spines black tipped.

Length of body, ♂, 22 mm., ♀, 28.5 mm.; of tegmina, ♂, 22 mm., ♀, 27 mm.

Described from 2 ♂, 3 ♀, obtained by G. R. Crotch in British Columbia.

This species is closely allied to *H. (X.) neglectus*, from which it is to be distinguished mainly by the greater breadth of the dark markings on the wings, the darker colors of the body and tegmina, and far less brightly contrasted sutural stripe of the latter.

HIPPISCUS (X.) NEGLECTUS.

Oedipoda neglecta Thom., Proc. acad. nat. sc. Philad., 1870, 81-82; Rep. U. S. geol. surv. Wyo., 276-277; Syn. Acrid. N. A., 128-129; Rep. U. S. surv. 100th mer., 5, 881-882, pl. 44, fig. 3; Bull. U. S. geol. surv. terr., 4, 483.

Arphia neglecta Thom., Proc. Dav. acad., 1, 254.

Hippiscus neglectus Scudd., Bull. U. S. geol. surv. terr., 2, 264; Thom., Rep. ent. Ill., 9, 95, 114-115.

Xanthippus neglectus Sauss., Prodr. Oedip., 94-95; McNeill, Psyche, 6, 63-64.

Cratypedes putnami Thom., Proc. Dav. acad., 1, 257-258, pl. 36, fig. 6; Rep. U. S. ent. comm., 2, 259.

Hippiscus lineatus Scudd., Proc. Bost. soc. nat. hist., 19, 31; Ent. notes, 6, 9; Cent. Orth., 48, 84; Rep. U. S. ent. comm., 2, app. 2, 26; Sauss., Prodr. Oedip., 87.

(Not *Oe. neglecta* Thom., Key Ill. Orth., 3; Bull. Ill. mus., 1, 64.)

This species is somewhat variable, especially in the markings of the tegmina, which at one extreme resemble those of species of *Trimerotropis*, at the other those of *Encoptolophus*, and in some are almost entirely of a warm brown color with concolorous sutural stripe and the merest clouds of lighter

shades barely indicating any markings at all. It is hardly surprising that it has been described under several names.

I have before me 28 ♂ and 34 ♀, mostly taken by myself in Colorado and the adjoining territories on the west and north and at an elevation ranging from 6000–8500', in July and August. This is apparently the principal region of its abundance, but it extends southward to southern Utah (E. Palmer), northeastern New Mexico (C. Thomas) and the borders of Arizona (Thomas), Arizona (Bruner in litt.), westward to various localities in Nevada (H. Edwards), Camp Hallock, Nev. (E. Palmer), Ruby Valley, Nev. (R. Ridgway), near Lake Tahoe, California (S. Henshaw in Capt. Wheeler's explorations of 1876), and the Sierra Nevada, Calif. (H. Edwards); and northward to Montana where according to C. Thomas it was collected by Dr. E. Coues, and west of which I have seen specimens sent me by Mr. Bruner from Soda Springs and Coeur d'Alene, Idaho, and Yakima River, Washington, July 18; Bruner also informs me that he has specimens in his collection from Ft. McKinney, Wyo.; Salmon Co., Henry Lake, Beaver Cañon, and Camas Prairie, Idaho; Colville, Washington; and even from Ft. McLeod, British America. It is twice stated by C. Thomas to occur in southern Illinois, but by a wrong identification for *H. (H.) haldemanii*; it does not seem to occur east of the foot hills of Colorado, the easternmost localities known to me being Blackhawk, July 2 (A. S. Packard), Beaver Brook Cañon, 6000', July 11, and Georgetown, 75–8500', July 12–18 (S. H. Scudder), and Manitou, 6300' (July 14, A. S. Packard, and Aug. 24–25, S. H. Scudder).

HIPPISCUS (X.) MONTANUS.

Oedipoda montana Thom!, Rep. U. S. geol. surv. terr., 5, 462–463; Syn. Acrid. N. A., 129–130; Glov., Ill. N. A. ent., Orth., pl. 12, fig. 12.

Hippiscus montanus Sauss., Add. prodr. Oedip., 170.

This species appears to be wide spread though rather rare, perhaps local. It comes from Idaho (Franklin, June 12, Bruner), and Thomas also reports it from the upper part of the Snake River plain near the mountains, and in southern Montana. He adds that it was not noted south of Market Lake, but from the north or Atlantic slope of the range to Virginia City in Montana. Two of his types which I have seen through the favor of Dr. Riley are marked as coming from Montana and Idaho. But it also occurs further south and east, for it is found in the southwestern part of Holt Co., Nebr. (Bruner), and the greater part of the Sand Hill region of central and western Nebraska (Bruner in litt.), as well as in New Mexico (Taos Valley, Bruner in litt.) and at Holbrook, Arizona (Bruner).

HIPPISCUS (X.) LATERITIUS.

Xanthippus lateritus Sauss., Prodr. Oedip., 92–93.

I have not seen this species, which seems from Saussure's description to fall in this immediate neighborhood. It is described from Nevada.

HIPPISCUS (X.) CALTHULUS.

Xanthippus calthulus Sauss., Prodr. Oedip., 93.

I have a single ♀ of this species taken by Crotch in southern Nevada. Saussure's specimens also came from Nevada, but Bruner sends me a specimen from Placer Co., California, taken in June.

HIPPISCUS (X.) *GRISEUS* sp. nov.

Almost uniformly griseus, moderately robust and rather below the medium size. Head not very broad nor very tumid above, the summit subrugulose; fastigium of vertex with distinct and moderately elevated, strongly bent lateral walls, open or partially closed behind, the median carina extending faintly to the centre, separated by a slight V-shaped wall from the nearly circular biareolate median foveola; lateral foveolae moderately distinct, of medium size, rounded triangular; frontal costa of moderate breadth, narrowed somewhat at summit where it shows a slight median carina and below the ocellus where it is deeply sulcate, expanding and fading at base. Pronotum expanding moderately on the metazona, which is faintly tumid, heavily stabbed anteriorly but without plications, rather densely and considerably verrucose, the process rectangulate, its margins subcrenulate by reason of the verrucosities, the median carina slight and equal, but subobsolete between the sulci, the lateral carinae distinct and tolerably sharp, but not elevated and confined to the metazona. Tegmina griseo-cinereous with dark brown fleckings, in the apical third of the wing faint and pretty uniformly distributed, before that largely collected into two narrow transverse stripes, one crossing the base of the outer discoidal field, the other and larger midway between it and the base, but all often very obscure, those of the apex sometimes obsolete. Wings pale citron at base with similar reticulation, vitreous at apex with black reticulation and an extramesial, strongly arc-

uate, dark fuliginous, moderately narrow band tapering along the hinder margin in passing to the anal angle which it fails to reach and leaving from two to three marginal lobes free at the apex; it is separated by a luteous line from the humeral vitta of the same color, the outer margin of which forms with that of the upper part of the arcuate band a straight oblique line; it runs to the base leaving the costal edge luteous. Hind femora very broad with strong arcuation of the inferior carina, the outer surface pale or fusco-cinereous with more or less obscured blackish brown oblique bands; interior and inferior surface and tarsi yellowish luteous, the spines black tipped.

Length of body, ♀ 33-34 mm.; of tegmina ♀, 28-33 mm.

Described from 5 ♀, taken by Dr. Edward Palmer, April 20-30, at Mokiak Pass, Utah.

HIPPISCUS (X.) *VITELLINUS*.

Xanthippus vitellinus Sauss., Prodr. Oedip., 94.

I have one female of this species from Nevada (H. Edwards), the locality from which it is described by Saussure. Mr. Bruner also sends me specimens from Reno, Nevada, and Umatilla, Oregon, June 25, and reports it from Idaho between Beaver Cañon and Henry Lake.

Edwards notes that in life the hind wings are red at base.

HIPPISCUS (X.) *AURILEGULUS* sp. nov.

Very dark brownish fuscous, not very robust and of small size. Head rather broad at summit but not tumid, the frontal costa a

little more prominent than usual, the face and cheeks more or less finely sprinkled with dark cinereous, the summit subrugulose; fastigium of vertex shallow, open behind and also in front, where the subcircular faintly biareolate median foveola is completely blended with it; median carina slight, passing a variable distance into the fastigium; lateral foveolae rather pronounced but small and triangular oval; frontal costa moderately slender, considerably narrowed at the summit, almost as much so and with unusual abruptness below the ocellus, expanding considerably at base, sulcate throughout, sometimes with a median carina above. Pronotum moderately stout, expanding almost regularly from base to apex, but not greatly; the process of metazona rectangular, its margins subcrenulate; the dorsal surface plane, subverruculose; median carina nearly obliterated between the principal sulci with a slight discal scutellum, otherwise equal, straight, and slight; lateral carinae sharp but not elevated throughout the metazona, the lateral lobes of metazona almost as rough as the dorsum. Tegmina dark brownish fuscous with faint brown or brownish cinereous markings, the apex subvitreous, mottled obscurely with brownish fuscous; the principal lighter markings are a broad but inferiorly narrowing transverse patch at the end of the basal third of the tegmina, a narrow but variable transverse stripe just beyond the extreme base of the outer discoidal field and a very irregular and obscure inferior blotch at the very base of the tegmina; sutural line flavous and very distinct. Wings bright citron yellow at base with corresponding reticulation, obscure hyaline at apex with black reticulation and a rather narrow, arcuate, extramesial, fuliginous band, narrowing as it passes along the outer margin toward the anal angle, which it nearly or quite reaches and leaves about three of the marginal lobes free at the apex; the apex is also obscured almost or quite as deeply next the margin, but the outer limits of the band are determinable; it is separated by a pallid

line from the humeral vitta, the outer limits of which are subcontinuous with its own and which extends almost to the base, leaving a fulvous edge of the costal margin hardly obscured by a stigma. Hind femora dark cinereous crossed more or less distinctly by three oblique blackish stripes, beneath and within mostly blue black, the tibiae coral red with black tipped spines.

Length of body, 21.5-23 mm.; of tegmina, 23-25.5 mm.

Described from 3 ♂ taken in California by H. Edwards (his No. 79) and in Sonoma Co., April 27-May 9, by Baron R. von Osten Sacken.

HIPPISCUS (X.) STIGMOSUS sp. nov.

This species differs from the preceding only in the markings of the tegmina and wings and may prove to be only a varietal form. The tegmina differ in having the markings still more obscure with the single exception of the spot at the base of the outer discoidal area which is more pronounced and whitish; and of the sutural stripe which is just as bright as in the other species; the mottling of the apex is almost entirely or quite lost. In the wings the extramesial band, besides being generally fainter, and sometimes broken into maculae by the penetrating citron colored veins, also extends to a much less distance toward the anal angle, sometimes hardly more than half way toward it.

Length of body, ♂, 25 mm., ♀, 34 mm.; of tegmina, ♂, 25 mm., ♀, 29 mm.

Described from 3 ♂, 1 ♀, received from California (J. Behrens), Napa Co., California, (H. Edwards), and southern Nevada (G. R. Crotch). Mr. Bruner also sends me specimens from Ukiah, California, collected in April by J. H. Burke, and from Placer Co., California, taken in June.

PREPARATORY STAGES OF CLISIOCAMPA EROSA STRETCH.

BY HARRISON G. DYAR, BOSTON, MASS.

CLISIOCAMPA EROSA Stretch.

1881.—Stretch, Papilio, i, 67.

Egg.—The egg mass is small, laid to form a ring near the tip of a twig and covered with varnish. Its length is about 15 mm., the thickness only slightly greater than the longest dimension of the eggs. The eggs are irregularly cylindrical, flattened above and below, and closely packed. Color white, but smeared with the dark brown frothy varnish. Diameter .5 mm.; height .8 mm.

First larval stage.^{*}—Head rounded, shiny black, whitish at vertex, with short pale hair; width .40 mm. Body cylindrical, velvety black, except an obscure paler substigmatal line. Long whitish hairs arise from minute black warts, several from each, but with a shiny base to each hair. The larvae spin no nest, but merely a slight web over the leaves upon which they rest. In the later stages they are often found in large masses low down on the trunks of the trees without any covering. They resemble *Clisiocampa distria* in habit.

Second stage.—Head higher than wide, rounded, black; width .65 mm. Cervical shield, warts and thoracic feet black; body blackish, with subdorsal, lateral and substigmatal yellowish white lines; a faint dorsal line of bluish white. Hair long, thick, white, spreading from the small warts. Joint 12 is a trifle enlarged. As the stage advances the body becomes blue gray, except the lateral region which is brown gray; the lines are ochre yellow, the subdorsal one with a broad black band above it, leaving a dorsal band of blue gray. On joints 3, 4 and 12 are large, elevated, velvety black, subdorsal spots, one on each.

Third stage.—Head rounded, black with a slight bluish tinge; width 1.1 mm.[†] Body

black, joint 2 bluish with a large subdorsal wart; large black spots on joints 3 and 4. A dorsal blue line, broken into a series of nearly connecting segmentary spots, enlarged on the anterior part of the segment and tapering behind, present only on joints 3–12. Joint 13 bluish. An orange subdorsal line; a blue band below it; a yellowish lateral line; a narrower blue band; a substigmatal yellowish line, each of these narrowly separated by the black ground color; a yellowish line along the bases of the legs. Abdominal feet black, testaceous at tip. Venter black.

Fourth stage.—Head bluish with small black spots, labrum white, jaws black; width 1.4 mm. Body flattened below, feet spreading, joint 12 a little enlarged dorsally. A row of white dorsal spots, one on each segment on joints 3–11 but nearly broken into two, a large spot narrowly connected with a little one behind it. The orange subdorsal line is supplemented by a few orange dashes in the dorsal space; lateral and substigmatal lines orange, but paler, the blue filling in nearly the whole space between them, except for the spots on joints 3, 4 and 12, and a row of much smaller ones on the intervening joints. The broken line along the bases of the legs is pale orange. Joints 2, 12 posteriorly and 13 are blue gray. Hair all reddish, thin on the back, but quite thick subventrally. Feet black, the abdominal paler at the tips.

Fifth stage.—Very much as before; width of head 2.1 mm. The anterior one of the two white dorsal spots on each joint of joints 3–12 is pointed behind and followed by the posterior small rounded spot. On joints 3, 4 and 12 the blue band is broken by a quadrate black spot as in the previous stage and on joints 5–11 and 13, there is a small black spot, defined as an incision in lower edge of band.

* I did not find the eggs until they were hatched; but I feel confident that the larvae had not passed a moult.

† This is abnormally large, but the measurement was made with care from several examples.

Sixth stage.—Nearly as in the two previous stages; width of head 3.2 mm. The dorsal space is partly filled in with blue, except for a black edging to the dorsal white spots, a black spot on each side of the white spots at their obsolete junction and the short orange red streaks supplementary to the subdorsal orange red line. The white spots on joints 3 and 4 are larger than the others, single, elongate, and in some examples the posterior white dot on all segments is partly orange or rarely obsolete. The blue band is minutely black dotted, followed by the pale orange lateral line which is rather irregular. Space below, blue gray, the substigmatal line and the one along the bases of legs yellowish faint and broken, or obsolete; spiracles large, black; feet gray; venter blue gray with a median row of black spots. The cervical shield and anal plate are blue gray tinged with black. Subdorsal warts on joint 2 rather large; joint 12 enlarged a little dorsally. Dorsal hair very scant, blackish, the subventral hair thick, partly silky white with some dusky and reddish hairs intermixed.

Cocoon.—Enclosed in an outer layer of silk, elliptical thin, composed entirely of silk, made opaque by an exudation from the anus of the larva, which dries into a pale yellow powder. Size 25 X 8 mm.

Pupa.—Cylindrical, posterior abdominal segments rapidly tapering, rounded at both ends, no cremaster. Color black, rather shiny, covered with short brown pile, except the cases which are bare. Length 18 mm.; width 4 mm. Duration of this stage 26 days. The moths appear during July.

Food plants.—Oak (*Quercus*), poplar (*Populus*), willow (*Salix*), alder, (*Alnus*), wild rose, (*Rosa*), peach and cherry (*Prunus*), apple (*Pyrus*) and others.

Habitat.—Oregon and Washington west of the Cascade range. Found at Portland and Bonneville, Oregon, Seattle and Vancouver, Washington. This is the common *Clisiocampa* of the Pacific Northwest and takes the place of *C. disstria* of the Atlantic States. It

is abundant in the valley of the Columbia, but becomes more rare to the north. But two larvae were seen in Seattle, Wash., while in Portland, Or., many fruit and shade trees were largely defoliated by the larvae, and they were frequently observed resting in large compact masses on the tree trunks.

A LOWER SILURIAN INSECT FROM SWEDEN.

—For a long time the Devonian insects of New Brunswick were the oldest known from any part of the world. Seven years ago, however, Brongniart discovered in the lower part of the upper Silurian of Calvados, France, a single wing which he regarded as a cockroach and named *Palaeoblattina douvillei*. And now Moberg announces the discovery of an hemipterous insect, which he calls *Protocimex siluricus*, in the still older rocks of Flagabro in Scania, belonging to the upper members of the lower Graptolitic slates, that is the upper part of the lower Silurian. Figures are given in the *Förhandlingar* of the Swedish geological society.

ENTOMOLOGICAL NOTES.—The first signature of a new general Catalogue of Hemiptera has just been issued by Lethierry and Severin at Bruxelles. The arrangement is systematic down to the genera but the species are given alphabetically and the number of species added at the end of each genus and subfamily. The present sheet includes a portion of the Pentatomidae: the Plataspidæ (19 genera and 187 species), the Corimelaenidae (10 genera, 66 species) and a few Scutelleridae. It will prove of great service.

Entomologists everywhere will regret to hear that the serious illness which has, for the past two years, incapacitated Dr. H. A. Hagen renders it improbable that he will be able to do any further work. Dr. Hagen has had charge of the collections of insects in the Museum of comparative zoology at Harvard University since October 12, 1867, and during this long period of twenty-five years has applied himself with entire devotion to the interests of the department. The scientific

value and present excellent condition of the collections are the result of his faithful and disinterested work. Recently the department has been placed in charge of Mr. Samuel Henshaw.

In a "partial catalogue" of the animals of Iowa published by the Iowa Agricultural College, Prof. H. Osborn enumerates 183 species of Ichneumonidae, Cynipidae and Tenthredinidae, 80 butterflies, 357 moths and 1255 Coleoptera.

Some interesting observations on the habits of the young of mole-crickets are given by Dr. E. W. Doran in Science for Oct. 14. Among other things he finds that previous to their first moult they can jump to the distance of five or six inches.

The notes and figures of Myriapoda left by the late A. Humbert are to be published shortly by the Société de physique et d'histoire naturelle of Geneva under the supervision of Dr. H. de Saussure. The text is

rather meagre but the figures are valuable and finely executed.

PROCEEDINGS OF SOCIETIES.

CAMBRIDGE ENTOMOLOGICAL CLUB.

14 October, 1892.—The 172d meeting was held at 156 Brattle Street. Mr. S. H. Scudder was chosen chairman and Mr. A. P. Morse secretary pro tem.

Mr. S. H. Scudder reported the capture of *Anthomaster leonardus* near Gardiner, Me., further east than it was before known; the female was seen laying eggs Aug. 29th on *Agrostis scabra*; these hatched in about 20 days, but the larvae refused ordinary grasses, and as they were as plump when a month old as when born, it seemed probable that their habit was to hibernate without first feeding.

Mr. S. Henshaw reported *Callidryas enbule* as not uncommon this year on Nantucket in the latter part of September.

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PSYCHE,

A JOURNAL OF ENTOMOLOGY.

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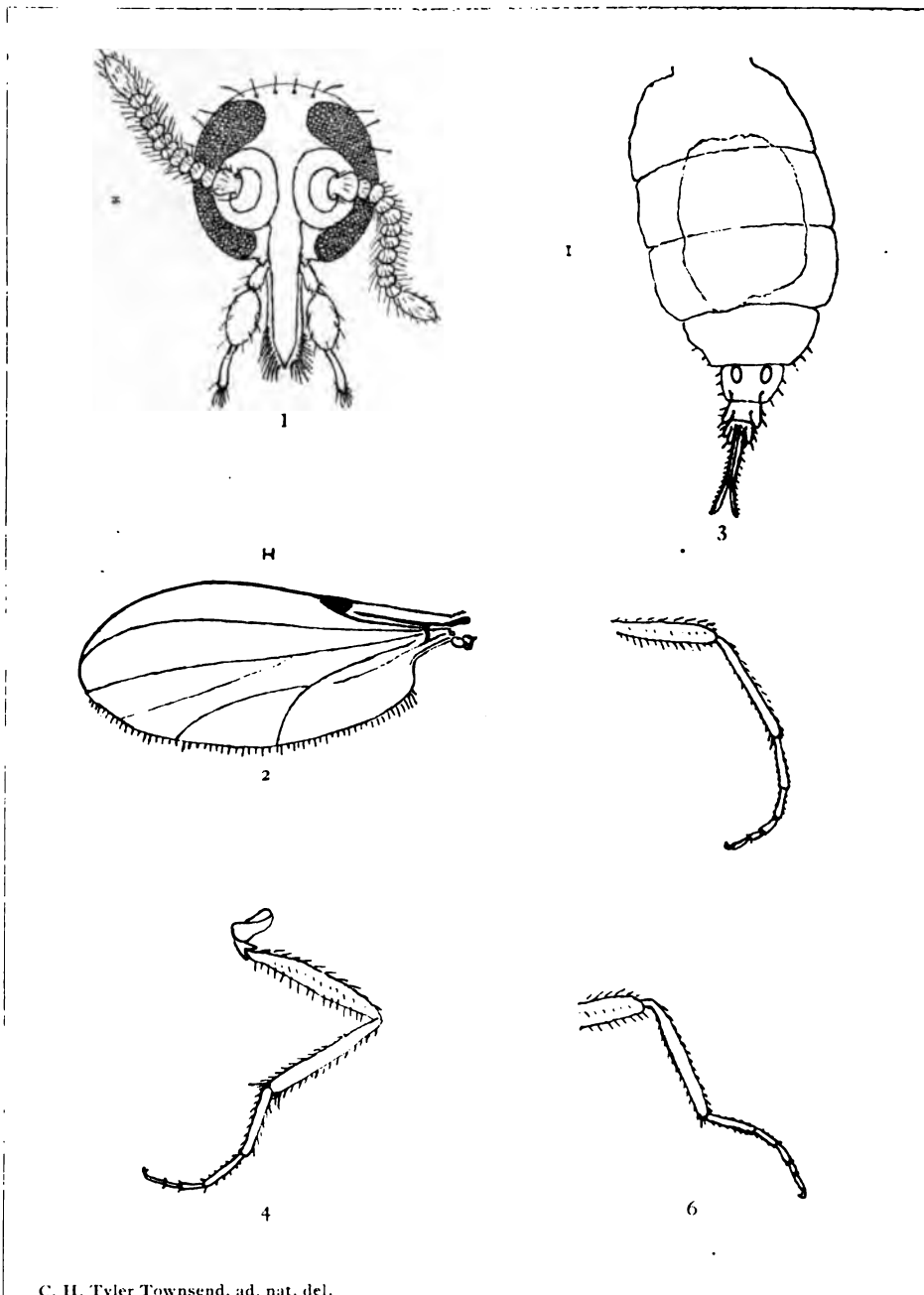
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C. H. Tyler Townsend, ad. nat. del.

Tersesthes torrens Twms. ♀.

PSYCHE.

AN INTERESTING BLOOD-SUCKING GNAT OF THE FAMILY CHIRONOMIDAE.

BY C. H. TYLER TOWNSEND, LAS CRUCES, N. MEX.

While breaking camp the past summer, on the Continental Divide in western New Mexico, at a point about 6 miles west of Patterson, in the western part of Socorro county, I noticed a small gnat in some numbers on the horses. This was on the morning of June 21st. The gnats were very small and black, but their abdomens being distended and swollen with blood gave them a red appearance. They were found mostly on the head and face, particularly around and below the eyes of the animals. A few specimens were hurriedly put in alcohol at the time. The altitude of this place was something over 7000 feet.

Quite recently, while attempting to determine these gnats, I found at first some difficulty in satisfying myself as to their family position. I believe now, however, that they properly belong in the Chironomidae. In their venation, they much resemble the section *Anareтина*, provisionally located by Loew and Osten Sacken in the Cecidomyiidae. The hind tibiae, however, have distinct terminal spurs, which is about the only

character that would exclude them from that section. In this character, they would approach the Mycetophilidae, but the venation (see Pl. 8, fig. 2) is so decidedly cecidomyiid in its character as to preclude this idea. There are six longitudinal veins, the fifth vein is forked, and the fourth is to the best of my perception also forked; there are no cross-veins whatever. In their general aspect, and the consensus of their characters, they approach the genus *Ceratopogon* of Meigen; and also the genus *Oecacta* of Poey, which latter was erected for a small blood-sucking gnat in Cuba, known to the inhabitants of that country as "El jejen." The antennae of the present form are 13-jointed (♀), and the palpi are only 3-jointed (see fig. 1 of plate). While the venation is more cecidomyiid than that of *Oecacta*, the general form of the body, as well as that of *Ceratopogon*, is quite the same. The lancets and labium are much the same in structure. The palpi are quite similar, except that *Oecacta* may be said to have two additional joints more at the end, and *Ceratopogon*

one. There is quite an important difference between *Oecacta* and the present form in the shape of the eyes, which in the latter are reniform or deeply hollowed out on the inside margin, the antennae being set in a cavity partially enclosed by the excavated orbit. In this respect it resembles *Simulium* and most of the *Cecidomyiidae* and *Chironomidae*. Judging from the plate (see plate 27 of Poey's *Memoirs* on the *Nat. Hist. of Cuba*, vol. I), *Oecacta* does not possess this peculiarity. *Ceratopogon* has the palpi 4-jointed, and the conformation of the antennae is peculiar, especially in the ♂. It must be remembered that I have only ♀ specimens of the present species, and that the antennae of the ♂ may or may not be differentiated in form.

The present form, with the genera *Ceratopogon* (including *Heteromyia* Say) and *Oecacta*, possibly also *Dia-mesa*, differ to quite an extent from the rest of the *Chironomidae*. As a group, they nearly approach the *Anaretina* in their venation, the present genus showing the greatest resemblance in this respect, and differ from the other *Chironomidae* by the body and wings being shorter and stouter, not culicid-like or elongate and narrowed, as in *Chironomus*, *Tanypus*, et al. The venation is simpler; and the lancets and labium are more elongate, and about equal in length.

The form here figured differs so obviously from those genera already described that there seems no question of the advisability of making it the type of

a new genus, which I shall call *Tersesthes* (Gr. ~~terpesthes~~, to become dry or thirsty). Its characters are as follows:

TERSESTHES nov. gen. ♀ (see plate 8).

Antennae 13-jointed, set in large circular excavations in the middle of the head; first joint largest, round; second joint more elongate, smaller, but larger than following joints; last joint elongate conical; intermediate ten joints equal, sub-moniliform, with hairs somewhat shorter than width of joints. Palpi 3-jointed, longer than proboscis, first joint shortest, second joint swollen, third narrow with a terminal whorl of hairs; proboscis consisting of a lower lip (labium), with the lancets free but usually more or less approximated to its anterior aspect, both of equal length, extended straight downward, about as long as the head, lancets serrate on outer edge at tip. No ocelli. Eyes reniform, rather deeply excavated on inside margin, dichoptic, front averaging one-third width of head. Thorax moderately stout, but not humped, a little wider than head, longer than wide, without transverse suture, scutellum prominent. Abdomen 7-jointed, somewhat elongate, not wider than thorax, first three segments subequal, fourth smaller, three terminal segments narrowed; ovipositor exerted, consisting of two clavate pieces joined laterally on basal half and terminally divergent. Wings moderately broad, not elongate, hind margin with a delicate fringe of hairs, surface sparsely clothed with very short microscopic hairs (revealed only with a high objective); six longitudinal veins, the first and second approximated, strongest, ending at about one-third the length of wing; third gently curved distally and ending near the wing apex, fourth apparently forked, fifth distinctly forked, sixth becoming obsolete before fork of fifth; an apparent rudiment of a seventh vein; no cross-veins, except one

at extreme base of wing which connects the first and sixth veins, marginal vein not extending beyond tip of wing. Legs slender, not dilated, coxae not elongate; hind tibiae spurred, middle and even front tibiae with microscopic spurs; metatarsi elongate, second joint of hind tarsi also elongate, of middle tarsi somewhat elongate, of front tarsi scarcely so, penultimate tarsal joint of all the feet shortened, the last and antepenultimate joints about equal; no pulvilli.

Tersesthes torrens n. sp. ♀.—General color blackish. Eyes dark brown; antennal excavations cinnamon colored, nearly three times the diameter of first antennal joint; front. face, and lancets shining black, the front with four blackish hairs on vertical margin arising from four papillae; antennae black, clothed with whitish pubescence; palpi blackish, labium brownish with some whitish pubescence terminally; occipital orbits with a few black hairs. Thorax and scutellum deep shining black, smooth, glabrous, except that the thorax has some scattered black hairs anteriorly. Abdomen soft opaque brown, varying to light brown, in some of the specimens flavous or rufous at base; balsam mount showing two oval black spots (bodies?) at base of fifth segment; ovipositor brownish. Legs blackish, tarsi brownish, tibiae slightly so. Wings grayish hyaline, with hardly a smoky flavous tinge, the delicate fringe of hind margin somewhat longest on anal angle where it terminates abruptly; veins pale, except first and second longitudinal veins which are brown and end in a brown stigma on costal margin (the first vein becomes obsolete just before reaching stigma); halteres brownish, knobs whitish.

Length of body (incl. ovipositor), 1.3-5 mm. (empty) to 2 1-5 mm. (abdomen distended with blood); of wing, 1 1-5 mm. Fresh and alcoholic specimens are slightly longer. Described from both dried and alcoholic specimens, and balsam mounts. Six

specimens collected, June 21, on Continental Divide, Socorro county, N. M., 7000 ft. This gnat was not observed at any other place than the one above named.

Note.—It should be stated that what I have called the first longitudinal vein is the auxiliary vein of other families. I have been in doubt whether to describe the wing as having five, or six, longitudinal veins, since the first two in the balsam mount show only as the sides of a single vein. Since, however, they appear in the dry wing, with a low power, as two distinct veins, I have so considered them, and have made the drawing of the wing to represent this appearance.

EXPLANATION OF PLATE 8.

Tersesthes torrens Twms. ♀.

Fig. 1.—Head, front view, showing lancets, labium, palpi, antennae, antennal excavations, and reniform eyes.

Fig. 2.—Wing. (It should be stated that the stigma does not show in the balsam mount as represented in the figure, but there is a slighter, more general infuscation in the region of the first two veins.)

Fig. 3.—Abdomen, dorsal view, showing ovipositor, two oval black bodies of fifth segment, and a large irregular contained body (mostly in second and third segments), probably the alimentary canal distended with blood.

Fig. 4.—Hind leg, with coxa attached.

Fig. 5.—Middle leg.

Fig. 6.—Front leg.

Figs. 2 to 6 are enlarged on the same scale. Fig. 1 is still more greatly enlarged. The hair lines accompanying figs. 1 to 3 show the natural size. The drawings were all made from balsam mounts, and outlined with the camera lucida. The scanty material in my possession prevents the figuring at the present time of the component pieces which form the lancets.

HERACLIDES CRESPHONTES.—On page 294 of the present volume of *Psyche* a note is made of the capture of *H. crespfontes* in Massachusetts, and it is remarked that no other specimen has been known to have been seen since 1883.

One other specimen has certainly been obtained since then, the late James A. Wright having found one at or near Milton, Mass., during the summer of 1885. The specimen being very fine was shown with a few other rare species at the Natural History store then located at 409 Washington St., Boston.

The specimen was found, if I recollect rightly, at early dusk in a small clearing in the woods not far from the town, the day being very warm and more or less cloudy. Not being familiar with the species Mr. Wright sent it to New York for identification, and it is now in the collection of a Boston entomologist. *Lewis E. Hood.*

ANTS BREEDING IN AND IN.—Forel announces (*Ann. soc. ent. Belgique*, v. 36 p. 458) that among ants of the genera *Anergates* and *Formicoxenus* there is no other male than a wingless ergatoid form, such as sometimes accompanies the normal male in other genera, and that therefore pairing must always take place in the ant hill itself between brothers and sisters; so we have here cases of perpetual consanguineous reproduction. "Among ordinary ants the winged ♂ and ♀ quit the nest in which they were born, take flight, and pair in mid air with their congeners of other nests, permitting numerous crosses. But in the case of the genera which have only an apterous male perpetual consanguineous pairing ensues, for in one and the same nest there are found only brothers and sisters, and these brothers and sisters can only pair with one another. The fact appears absolutely clear in the genus *Anergates*, where one finds in each ant hill only a single fecundated female, the mother founder of the colony."

PROCEEDINGS OF SOCIETIES.

CAMBRIDGE ENTOMOLOGICAL CLUB.

11 November, 1892.—The 173d meeting was held at 156 Brattle Street. Mr. S. Henshaw was chosen chairman.

Mr. Harrison G. Dyar of Roxbury was elected an active member.

Mr. S. H. Scudder exhibited the series of Phasmidae in his collection arranged after the system introduced by Stål, and showed that the species found in our country were more numerous than had been supposed, including at least four species of *Diapheromera*, one of *Sermyle*, two of *Bacunculus*, one or possibly two of *Anisomorpha* and two of *Bacillus*. The last was the most interesting, as the genus has not hitherto been recognized in the new world and all the other genera are distinctively American. One of the species, which he proposed to call *B. coloradus*, was found in Colorado at a height of about 5500', and had the metathorax very much shorter than the mesothorax, their median carina much more pronounced than the laterodorsal carinae, and with scarcely a trace of granulation, except very feebly in the front portion of the mesothorax, besides a unicolorous head. The other species occurs in Arizona and extends south into Mexico; it has the metathorax but little shorter than the mesothorax, both median and laterodorsal carinae pronounced, the whole body sparsely and finely granulate and the head longitudinally striped; he proposed for it the name *B. carinatus*. In both the antennae beyond the second joint are multiarticulate, but the joints, which are transverse, so nearly connate as to be difficult to distinguish. Only females are known.

Mr. S. Henshaw showed a specimen of *Anthrenus scrophulariae* taken at Cambridge, Mass., in 1869, and one of *Aramigus fulleri* from the same locality taken in 1868; these dates are earlier than any hitherto recorded. Both specimens are from the collection of the late Mr. Edward Burgess.

DESCRIPTIONS OF NEW SPECIES AND GENERA OF WEST AFRICAN LEPIDOPTERA.

BY W. J. HOLLAND, PH. D., PITTSBURGH, PENN.

The species described in the following paper are all from the Valley of the Ogové River except when otherwise indicated. The types are in my collection.

AGARISTIDAE.

PHASIS, WALK.

1. *P. (?) astrapeus*, sp. nov. ♂. The palpi are pale brown beneath and black above. The pectus is broadly orange, and the front legs are narrowly edged with the same color. The rest of the body above and below is black, except that the eyes on the inner margin are narrowly edged with white. The wings above are velvety black, the anteriors crossed beyond the cell by a moderately broad and even band of sulphur yellow, which does not reach the costa, and terminates abruptly before the outer angle; the posteriors have a broad tapering band of the same color running from the base and terminating before the inner angle. This band which does not touch the costa, has its outer margin convex and its inner margin straight. The markings of the wings are upon the under side as upon the upper, and in addition there is a quadrate whitish spot at the end, and a yellow ray at the base, of the cell of the primaries, and a yellow basal ray is found upon the costa of both wings. Expanse, 53 mm.

♀. The female does not differ from the male except that the wings are broader and the antennae are not swollen before the end, but filiform.

I refer this species with a shade of doubt to the genus *Phasis*, though in its structure,

so far as ascertainable without dissection, and in its markings upon the upper side, it nearly resembles *P. tribuna*, Hübner, from the Antilles.

AEGOCERA, Latr.

2. *A. Gladiatoria*, sp. nov. ♂. Palpi brown, front light orange, collar and upper sides of thorax maroon, traversed by a median band of pale orange. The pectus and the abdomen orange, with a median line of maroon upon the upper side of the abdomen. The forewings upon the upper side are rich maroon. From the base to the middle of the wing just below the cell is a horizontal sword-shaped band of pearly white and a broad subapical transverse band of the same color not quite reaching the costa and tapering off before reaching the outer angle. A faint V-shaped mark appears upon the dark ground of the wing near the costa just before the subapical white band and there is also a faint submarginal line of the same color. The upper side of the posteriors is pale orange broadly margined with brown, the margin widest near the outer angle. The bolder markings of the upper side are reproduced upon the under side, but paler and less sharply defined.

♀. The female does not differ from the male except that she is much larger.

Expanse of wings. ♂ 35 mm.; ♀ 45 mm.

CHALCOSIIDAE.

ANAMOROTES, Feld.

3. *A. tenellula*, sp. nov. ♂. Antennae brown. Body and legs red. Wings semi-translucent, with the costa of the primaries

and the apical half of both primaries and secondaries fuscous.

♀. Marked exactly as the male, but larger.

Expanse of wings, ♂ 28-32 mm.; ♀ 40 mm.

A closely allied, if not identical, species is in the British Museum, unnamed, from Angola.

4. *A. leucolena*, sp. nov. ♂. Antennae fuscous at extremity, fulvous at base. Body fulvous. The wings are semi-translucent, white, with the primaries broadly black upon the apical third, and the secondaries almost imperceptibly touched with the same color at the extremities of the nervules.

♀. Marked as the male, but larger.

Expanse of wings, ♂ 30-35 mm; ♀ 35 mm.

ZYGAENIDAE.

ADSCITA, Retz.

5. *A. chloanges*, sp. nov. ♂. Antennae long, terete, enlarged before the extremity, black. The front is bronze red. The rest of the body and the legs are black glossed with scales of metallic green. The anterior wings upon the upper side are very dark brown or black, and are glossed with patches of metallic green scales as follows: a narrow linear patch above the cell upon the costa, a couple of broad roundish patches beyond the cell near the apex, and a somewhat interrupted linear streak below the cell above the submedian nervule. The secondaries, which are rounded at the outer and inner angles, and have the outer margin somewhat deeply excavated near the extremity of the first median nervule are translucent, hyaline, except upon the costa and outer margin, which are heavily bordered with black, except at the end of the second median nervule, where the border is comparatively narrow. Expanse, 24 mm.

I refer this species with much doubt to the genus *Adscita*, Retz., (*Procris*, Auct.-Ino, Auct.). It may constitute, as Mr. Butler

has suggested to me, the type of a new genus, but until I have sufficient material to make dissections, and also to characterize the female sex, I do not feel justified in erecting a genus for the reception of this single species.

POLLANISUS, Walk.

6. *P. obscurissimus*, sp. nov. ♂. Superficially scarcely distinguishable from *P. cyanota*, Meyr. from Sydney, N. S. Wales. The antennae are tipped with white upon the under side. The palpi, the tibiae, and the under side of the abdomen are yellowish white. The remainder of the body and the wings, both above and below, are smoky brown.

♀. Differs from the male merely in wanting the strong pectinations of the antennae, and in having less white upon the lower surface of the abdomen. Expanse, 14-15 mm.

SYNTOMIS, Ochs.

7. *S. Ogovensis*, sp. nov. ♂. Near *S. Natalii*, Boisd., from which it differs in having no translucent spot near the base of the primaries, and the transparent spot at the base of the secondaries is situated upon the inner margin of the wing, and not upon the cell as in *S. Natalii*. There is further no red band upon the abdomen as in Boisduval's species, and it is also slightly smaller in size. The color of the body and wings is black glossed with shining green. The antennae are tipped with white. There are five translucent spots upon the primaries; a round one at the end of the cell, another round one near the middle of the inner margin, and three forming a curved subapical series, the uppermost spot in which is round, and the two lower ones are oblong and divergent. There are two spots on the secondaries, a round one beyond the end of the cell near the outer margin, and a semi-lunar spot upon the inner margin at the base.

♀. The female is marked as the male. Expanse, 28 mm.

8. *S. leugalea*, sp. nov. ♂. Very near *S. constricta*, Butl., from which it may be distinguished by its smaller size, and the more pointed apices of the primaries, which are tipped with white. Otherwise it corresponds very nearly to Mr. Butler's species, with the type of which I have compared it. Expanse, 25 mm.

9. *S. elasson*, sp. nov. ♂. The outer margin of the primaries is strongly convex, and the apex is rounded. The basal half of the wing is vitreous. The outer half is black with a subapical series of three large, simple, oval, vitreous spots, the lower one merely separated from the hyaline space enclosed within the cell by the discocellular nervule. The costa and the inner margin are narrowly bordered with black, and the apex is tipped with white. The secondaries have no black border upon the inner margin, but are bordered upon the outer margin with black, broadly at the outer angle and then more narrowly, until the region of the submedian nerve where the black border is produced inwardly at its termination in a strong denticulation. The body and other appendages besides the wings are dark brown, almost black, except the tips of the antennae, the front, the patagia, the inner margins of the femora, the tibiae, the first tarsal joint, the lower edge of the abdomen, and two bands about the abdomen, which are all white. Expanse, 21 mm.

10. *S. elachista*, sp. nov. ♂. The primaries are marked as those of *S. elasson*. The secondaries are solidly black except near the outer angle where there is a round translucent spot, and on the inner margin, where there is a similar spot. The antennae are black. The collar, the thorax, and the abdomen upon the upper side are black. The front, the inner margins of the coxae and the tibiae, the under side of the abdomen, except the last four segments, and two annular bands surrounding the abdomen, one just

after the thorax, and the other on the fifth segment from its extremity, are all white.

♀. The female only differs from the male in being larger in size, and having the primaries more rounded at the apex. Expanse, ♂ 18 mm; ♀ 20 mm.

11. *S. miserabilis*, sp. nov. ♂. Marked in all respects as *S. elasson*, except that the secondaries have the entire margin surrounded with a narrow black band, and the primaries are not tipped with white at the apex, as in that species, and the subapical spot is divided into two by the first subcostal nervule. Expanse, 23 mm.

12. *S. puncticincta*, sp. nov. ♀. The wings are marked as in the preceding species, having the uppermost spot of the subapical series divided into two, and the lowermost spot of the three simply separated from the hyaline space of the cell by the discocellular nervule. The abdomen has the segments except the last four edged with white upon the under surface. Upon the fifth and sixth segments, reckoning from the extremity of the body, there are small lateral white spots, and upon the segment next to the thorax there are two similar spots, one on each side, and a third one above upon the middle line of the abdomen. The anal extremity is tipped with orange hairs. Expanse, 25 mm.

13. *S. leimacis*, sp. nov. ♂. The wings are narrow and produced, and the hyaline spaces which are arranged as in the preceding species are compressed and linear. The last spot of the subapical series is separated from the hyaline space in the cell by a moderately broad band of black scales. The color of the wings is bluish hyaline with black markings. The apex of the primary is not tipped with white. The antennae are white at the ends, as is also the front. The pectus is pale yellow, and so also the lower side of the abdomen. The patagia, the inner edge of the coxae and tibiae, the sides

before the anal extremity, and the anal tuft are bright orange. The remainder of the body and its ambulatory appendages are deep black. The abdomen of the male is greatly compressed after the thorax as far as the fifth segment from the end, where it is suddenly enlarged.

♀. The female is marked much as the male, but the wings are broader and the body is stout. The entire head and collar are orange, and there is an orange annular band surrounding the abdomen on the fifth segment from the end. Expanse, ♂ and ♀ 23 mm.

Described from a pair taken in coitu Feb. 20th, 1888.

14. *S. Goodii*, sp. nov. ♂. The wings are pointed at the apex of the primaries, and the outer margin of the primaries is only very slightly convex. The outer two-thirds of the primaries is heavily velvety black, marked by two moderately large hyaline spots, of which the uppermost, situated near the costa, about one-third of the distance from the apex is triangular, and the lower, which is suboval, is bisected by the second median nervule. The black area of the outer part of the wing is separated from the basal third, which is vitreous, by a line running from the costa perpendicularly to the inner margin near the middle. The inner margin of the clear space at the base of the primaries is narrowly bordered with black. The secondaries are heavily bordered with black at the outer angle and along the outer margin and very narrowly bordered with the same color along the inner margin. The marginal band is produced inwardly at the extremity of the first median nervule. The antennae are tipped with white. All of the remainder of the body and its appendages are black glossed with bluish green, except the inner margins of the coxae and tibiae, and the edges of the ventral segments upon the lower side, which are margined with white. Expanse, 25 mm.

15. *S. reutlingeri*, sp. nov. ♀. Allied to

the preceding species. It differs from it in that the broad black area covering the outer two-thirds of the wing is defined inwardly by a line running from the costa diagonally to the outer angle, and not perpendicularly to the middle of the inner margin as in *S. Goodii*. Furthermore the hyaline spots of the apical region are much larger and the upper triangular spot is bisected by the first subcostal nervule, so that by reason of the bisection of the lower spot by the second median nervule, there is produced the appearance of four spots in this part of the wing. The secondaries are very narrowly and evenly margined with black. The front is white. The entire body, the antennae and the legs, are uniformly dull black, without any lighter markings. Expanse, 27 mm.

16. *S. leucerythra*, sp. nov. ♀. The anterior wings are strongly convex on the exterior margin, and rounded at the apex. *Upper side.* The prevalent color of the anterior wings, the thorax, and the abdomen is orange-rufous. The front, the posterior wings, and a band behind the thorax are paler yellowish red. Both the primaries and secondaries are very narrowly and evenly margined with light brown. The anterior wings are marked by five hyaline spots, bordered externally by light brown. They are as follows: Three, forming a transverse, curved, median series, the uppermost spot in which is quadrate, and lies at the end of the cell, the second subtriangular, and situated below the cell before the origin of the first median nervule, and the third oval and lying between the submedian nerve and the first median nervule; a subtriangular spot situated near the costa, one-third of the distance from the apex to the base, bisected by the first subcostal nervule; and a large oval spot situated near the middle of the outer margin, and bisected by the second median nervule. The posterior wings are immaculate. *Under side.* The basal third of the primaries and the entire surface of the

ON THE SPECIES OF THE GENUS MIRAX FOUND IN NORTH AMERICA.

BY WM. H. ASHMEAD, WASHINGTON, D. C.

No species in the genus *Mirax* is yet described from the United States, although in *Insect Life*, v. 3, p. 15, I have indicated three species in Ms. reared by Dr. Riley at the Department of Agriculture.

In Europe, only a single species appears to be known, viz., *Mirax spartii* Haliday, the type of the genus, parasitic on *Nepticula septembrella* Stainton, a Tineid found mining the leaves of St. John's Wort, *Hypericum perforatum*.

The habits of our species conform to the European species, in that they are parasitic on the Tineina.

MIRAX HALIDAY.

"Maxillary palpi 4-, labial 3-jointed. Antennae 14-jointed. Eyes somewhat villose. Abdomen showing 7 segments above, 6 beneath, smooth, shining. Radius of the fore wing hardly inchoate, springing from the same point in the stigma as the 1st intercubital; two cubital areolets, the 2nd imperfectly separated from the radial. Terebra subexserted."—Marshall.

Our species may be synoptically represented as follows:—

Species black, base of abdomen pale.

Scutellum polished.

Three basal abdominal segments pale; second flagellar joint about as long as the first.

Stigma brownish-yellow; legs yellowish sometimes tinged with fuscous, the articulations pale; first submarginal and first discoidal cells confluent. *M. aspidiscae*.

Stigma fuscous; legs brownish-yellow, the tarsi fuscous; first submarginal and first discoidal cells distinctly separated.

M. minuta.

Scutellum finely punctate.

Stigma pale brownish; hind tarsi fuscous; first submarginal and first discoidal cells not entirely separated.

Antennae longer than body, the 7 terminal joints $2\frac{1}{2}$ times as long as thick. *M. lithocolletidis*.

Antennae longer than body, the joints after the 3rd 4 times as long as thick; all femora and the hind tibiae and tarsi tinged with fuscous. *M. grapholithae*.

Wholly brownish-yellow, all tarsi fuscous. *M. pallida*.

1. *M. aspidiscæ* sp. n. ♂ ♀.—Length 1.3 to 1.5 mm. Black, shining, but microscopically punctulate, pubescent; two basal joints of antennae and sometimes base of the third and legs brownish-yellow; sometimes more or less of the femora, especially toward base, posterior tibiae and tarsi fuscous or dusky in female; abdomen, in female with three basal segments pale, in male with only two, oval, black or brown-black. Antennae 14-jointed, as long as the body, the flagellar joints very gradually subequal after the second, the first and second the longest, about equal. Thorax without furrows, the scutellum polished, the metanotum with a median carina. Wings hyaline, the stigma and nervures pale brownish yellow, the first submarginal and first discoidal cells confluent.

Hab.—United States.

Types in National museum and Coll. Ashmead.

This species seems to be a common parasite on *Aspidisca splendoriferella* Clem., a small case-bearing Tineid on apple. Those in the National museum were reared in 1879, and the same is figured in Prof. Comstock's Report for the same year, pl. 2, fig. 2, *h*. My specimens were reared from this Tineid in 1888.

2. *M. minuta* sp. n. ♀.—Length 1 mm. Black, shining, faintly pubescent; flagellum brown-black, slightly incrassated toward the tip, the 7 terminal joints short, scarcely twice as long as thick; scape, pedicel, three basal abdominal segments and the legs, including all the coxae, yellow; tarsi fuscous.

Wings hyaline, the stigma fuscous, otherwise the venation pale yellow; the first submarginal and first discoidal cells distinctly separated.

Hab.—Jacksonville, Florida.

Types in Coll. Ashmead.

Comes closest to *M. aspidiscæ*, but its smaller size and the distinctly separated first submarginal and first discoidal cells readily distinguish the species.

3. *M. lithocolletidis* sp. n. ♂ ♀.—Length 1.5 to 1.6 mm. The head and thorax feebly rugose or punctulate, subopaque. Antennae filiform, 14-jointed, longer than the body, pubescent; scape beneath and pedicel at apex and beneath, yellowish; flagellum black or brown black, the joints to the last subequal, the last longer than the preceding; metanotum with a grooved line at the middle; face, basal half of abdomen and legs yellow or brownish yellow; hind tarsi fuscous. Wings hyaline, the costa and stigma fuscous, the other nervures yellowish; the first submarginal and the first discoidal cells not entirely separated. The first and second abdominal segments have a central longitudinal carina or fold.

In the male, the head, thorax and apical half of abdomen are fuscous, while the orbits (broadly), lower part of cheeks, the face, basal half of abdomen, and the legs are yellow.

Hab.—Washington, D. C. and Jacksonville, Florida.

Types in National museum and Coll. Ashmead.

The single specimen in the National museum was reared from a Leaf-miner on locust, *Lithocolletis ornatella* Chambers.

4. *M. grapholithæ* sp. n. ♂.—Length 1.5 mm. Head and thorax black, shining, although finely punctate and sparsely sericeous. Abdomen brownish-piceous, blackish towards apex, pale yellowish towards base; legs pale brown, the femora towards base and hind tibiae and tarsi, dusky or fuscous.

Head transverse, very little broader than the thorax, the occiput emarginate at middle, the cheeks margined; face below the antennae, prominently convex, shining, with sparse whitish hairs; clypeus separated, subconvex; mandibles piceous; palpi brown, the maxillaries very long. Antennae 14-jointed, longer than the body, setaceous, brown, the scape and pedicel yellowish; scape not quite twice as long as the pedicel; flagellum slender, cylindrical, the joints very slightly subequal, after the 3rd about 4 times as long as thick. Metanotum with a median sulcus bounded by carinae. Wings hyaline, the stigma and nervures pale brown.

Hab.—Washington, D. C.

Type in National museum.

The single ♂ specimen was reared May 3, 1881, from *Grapholitha prunivora* Walsh.

5. *M. pallida* sp. n. ♀.—Length 2 mm. Brownish-yellow, minutely closely punctulate. Antennae 14-jointed, fuscous toward tips, flagellar joints 1 and 2 about equal, as long as the two last joints united, joints 3 and 4 about the length of the 2nd, those beyond gradually become shorter, subequal. Eyes brown, subpubescent. Mesopleurae smooth. Metanotum with a distinct median carina. Wings hyaline, the stigma and nervures brownish yellow. Abdomen oval, as long as the thorax, the first segment with a narrow linear shield, the membranaceous margins broad; ovipositor as long as the basal tarsal joint in hind legs. All tarsi more or less fuscous.

Hab.—Jacksonville, Florida.

Type in Coll. Ashmead.

The large size and pale color readily distinguish the species.

NOTES ON THE LARVAL STAGES OF ARCTIA BLAKEI GROTE.

BY HARRISON G. DYAR, BOSTON, MASS.

EUPREPIA (CYMBALOPHORA) BLAKEI Grote.

1863—Grote, Proc. ent. soc. Phil., iii, 523. *Arctia*.

1874—Stretch, Zyg. Bomb. N. A., 224.

1892—Kirby, Cat. Lep. Het., i, 267. *Apan-
tesis*.

superba Stretch.

1874—Stretch, Zyg. Bomb. N. A., 227.

geneura Strecker.

1878—Strecker, Proc. Dav. acad. sci., ii, 270.

1884—French, Papilio, iv, 158.

1889—French, Can. ent., xxi, 162.

incorrupta Hy. Edwards.

1881—Hy. Edw., Papilio, i, 38.

shastaensis Behrens.

1889—French, Can. ent., pp. 35 and 162.

var. NEVADENSIS Grote and Robinson.

1866—Grt. and Robs., Proc. ent. soc. Phil., vi, i. *Arctia*.

1886—Grote, Can. ent., xviii, 109.

1892—Kirby, Cat. lep. Het., i, 268. *Apan-
tesis*.

behrii Stretch.

1872—Stretch, Zyg. Bomb., N. A., 75.

var. SULPHURICA Neumoegen.

1885—Neum., Ent. amer., i, 93.

elongata Stretch.

1885—Stretch, Ent. Amer., i, 105.

1892—Kirby, Cat. lep. Het. i, 270.

ochracea || Neum.

1883—Neum., Papilio, iii, 151.

In Kirby's catalogue the American species, formerly referred to *Arctia*, are distributed irregularly under three generic names. As the species do not seem to be separable generically, I adopt the oldest name for the genus, viz. *Euprepia* Ochs. (1810), under which name are found *E. pudica* Esp. and *E. fasciata* Esp. *Arctia* Schrank is restricted

to *A. villica* Linn. and *A. bioti* Oberthur, while the species formerly referred to *Euprepia*, viz. *E. caja* Linn. and allies, are referred to *Hypercompa* Hübn. (Tentamen, 1805?) which is the same as *Zoote* Hübn. (Verz., 1822?). The generic names of the catalogue may be used as subgeneric or group names; but the species must be better assorted than has been done. *Apantesis* Walker must be restricted to *A. nais* and *decorata*; *Callarctia* Packard will stand for the species with the veins lined with pale scales, while the name *Cymbalophora* Ramb. can be used for the American allies of *E. pudica* Esper, of which the present species, *E. blakei* Grt., is one.

The following notes were made on the larvae:—

Egg.—Sub-conoidal, flat at base, perfectly smooth even under the microscope; shining pale yellow; diameter 0.8 mm. The shell is transparent, so that the little larva can be plainly seen within. The eggs are laid unattached, so that they readily roll about.

First stage.—Head slightly bilobed, black and shining, paler around the mouth; width 0.4 mm. Body normal, whitish, the cervical shield black; hairs evident, single from the concolorous warts. black. Later the warts become black, large and distinct.

Second stage.—Head bilobed, shining light brown, blackish at vertices of lobes and around mouth; eyes black; width 0.6 mm. Body very pale brown, with an obscure, slightly whitish, dorsal line; warts large with many long, spreading, blackish hairs; cervical shield and warts black. There is the appearance of a subdorsal line, caused by the contrast of the pale ground color with the warts of rows 2 and 3.

Third stage.—Head bilobed, shining pale brown, black in front centrally and on vertex; ocelli large, black; width 0.8 mm. Body brown, with a rather broad whitish dorsal line; warts very large, black, with abundant long, spreading, black hairs, especially long posteriorly and supplemented by a few very

long white hairs, arising from joints 12 and 13. Cervical shield shining blackish brown; thoracic feet black. The larvae are very active in running to hide beneath leaves, etc., if disturbed.

Fourth stage.—As before; width of head 1.1 mm. The dorsal line is straight and even, well defined, nearly white. The body is a little mottled on the sides, dark, nearly black on the back.

Fifth stage.—Width of head 1.5 mm. Body, warts and hair all black except a narrow and rather faint reddish dorsal line, broken in the segmental incisures. Hair bristly, stiff and barbed, of irregular length. The body is pale ventrally and in the incisures; thoracic feet black, the abdominal ones pale. A few very long white hairs as before.

Sixth stage.—Head shining pale brown, black all over the vertices of the lobes and in front on each side of the central suture and around the ocelli; antennae and mouth pale brown; width 1.75 mm. Body black above, blackish brown below, mottled with paler, with an obscure reddish brown dorsal band; warts deep black, tuberculate; hair short, but dense, bristly and barbed, deep black except from wart 6 where it is whitish. A few (about four) very long white hairs arising from joints 12 and 13, directed posteriorly. Later the body becomes entirely deep black above with no dorsal line; the subventral hair is reddish.

Eggs received from Mr. J. B. Lambert, Yosemite, California.

As the accurate determination of species of *Euprepia* is difficult and attended with chances of error, I append a description of the moth from which these eggs were obtained.

*Not the normal sixth stage, as the width of head should have been 2.2 mm. The larvae were bred under disadvantageous circumstances, being carried from Portland, Or. to Plattsburgh, N. Y., where they finally died from the effects of the hot weather and confinement. The stage above described is an interpolated one and not the normal last stage. The species probably has but six stages naturally.

♀. Head and thorax above yellowish salmon color with the usual black marks; abdomen deep ochre yellow with a dorsal and lateral row of confluent black spots; below, the thorax, abdomen and legs are entirely black. Fore wings deep black with salmon colored bands, each narrowly bordered with yellowish on both sides. Basal half line absent, represented on one wing by a few scales on the costa; trans.-ant. line reaching from costa to internal margin, rather narrow, dilated at both ends; median band reaching from costa to just below the longitudinal submedian band, ending in a point; trans.-post. line slightly angulated, reaching only to the submedian band; terminal angular band (W-mark) normal, joining the trans.-post. band at about its middle; fringe and internal margin narrowly salmon color. Hind wings scarlet ("flame scarlet," Ridgway, plate vii, fig. 14) with a narrow uneven outer black border, obsolete before internal angle; three

submarginal rounded-triangular spots, the last one at anal angle; two discal elongate spots, the inner one much elongate and attaining the costa, the outer, small; a large spot on the middle of abdominal margin and a small one at base. All the black marks narrowly bordered with yellowish. Fringe narrowly yellowish salmon. Below, the colored parts of both wings are orange (Ridgway, Pl. vi, f. 3) with the black parts as above. Expanse 42 mm. The moth here described differs from all those referred to in the synonymy given above in the absence of the basal half line, and I propose for it the varietal name *perpicta*.

The character, though slight, is usually of such diagnostic value in the case of *E. blakei* that its absence in this form seems to warrant the different designation. Prof. French has described some moths of this form as *Arctia geneura* Strk. (Can. ent., xxi, 162).

A MONOGRAPH OF THE NORTH AMERICAN TACHINIDÆ.—Prof. C. H. Tyler Townsend is at present engaged on the preparation of Part I of a monograph of the North American Tachinidæ, which he hopes to have ready for publication in about two months from this date. The part will embrace the Phasiidæ, Gymnosomatidæ, Ocypteridæ, and Phaniidæ. Any persons having material in any of these groups will confer a favor by sending it to Mr. Townsend, who will return it fully determined. The monograph will aim to represent the entire fauna of North America north of the Isthmus of Panama, including the West Indian forms. Subsequent parts will follow in the course of time. Mr. Townsend has been engaged on this work for some years and has already a large amount of material on hand, but he is desirous of examining all possible specimens of the above groups, from within the limits stated, before sending the manuscript of part I to the printer.

ENTOMOLOGICAL NOTES.—Miall and Hammond have just printed a paper in the Transactions of the Linnean society of London on the development of the head in Chironomus, which will be found interesting from its representing a type intermediate between the apparently widely different types of Corethra and Musca, hitherto the best known. A great part of the head of the imago arises from paired invaginations extending far into the larval thorax.

A feast of Chionobas is offered in the new Part of Edward's Butterflies of North America, for it is devoted entirely to four species of that genus, of which the transformations of two, *C. jutta* and *C. brucei*, are described in detail and figured profusely with exquisite skill, admirably bringing out their distinctive features. Considering the home of these insects, one cannot too strongly commend the perseverance which has culminated in such a series of plates as these. The text, too, is full and interesting, indicating curious

differences of behavior of the same insect in different places. Altogether this genus of butterflies is one of the most perplexing and interesting, so far as life-histories go.

Dalla Torre's projected *Catalogus Hymenopterorum* in ten volumes has begun publication, the sixth volume dealing with the Chrysididae having just been issued.

An egg of an unknown Reduviid from Brazil, with a cap of most extraordinarily complicated structure, is described and figured by Sharp in the November Transactions of the Entomological society of London.

Bauer and Raspe of Nuremberg announce the early publication of Vol. 4 of Keyserling's *Die Spinnen Amerikas* containing the Epeiridae, edited by Dr. George Marx of Washington. 61 species from the United States are included in the work which will be sold for \$18.

The first part of the second volume of the *Actes of the Scientific society of Chili* is

entirely devoted (176 pp.) to a paper by Ruge Borne on a poisonous spider of that country, *Latrodectus formidabilis*. Although contributed to a French society, the memoir is in Spanish. There are no illustrations.

A fragment of a proposed Manual of the butterflies of America north of Mexico, comprising the six tribes of Nymphalinae which are exclusively tropical, is printed by S. H. Scudder in the Proceedings of the American academy of arts and sciences.

Captain Casey has published in the *Annals of the N. Y. academy* a fourth instalment (354 pp.) of his Coleopterological notices. It is almost entirely devoted to N. A. Rhynchophora, and more than half of it to the Barini, in which thirty-nine genera, eighteen of them new, are recognized.

The principal articles in *Psyche* are now all indexed in full in the Weekly review of newspaper and periodical literature, published weekly in Boston.

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PSYCHE.

COMMUNAL COCOONS AND THE MOTHS WHICH WEAVE THEM.

BY W. J. HOLLAND, PH.D., PITTSBURGH, PENN.

[Annual address of the retiring president of the Cambridge Entomological Club, 13 January, 1893.]

One of the comparatively recent discoveries in the field of entomological investigation has been that of the curious habit possessed by certain lepidopterous larvae of living in communities and weaving for themselves a large outer cocoon, or envelope, in which they each subsequently spin a smaller cocoon in which they undergo transformation into the chrysalid state, and from which they subsequently emerge as moths. Thus far this habit has only been observed in the hyponomeutid genus *Hyphantidium*, the genera *Anaphe*, Walk., and *Hypsoides*, Butl. (*Coenostegia*, Mabille), which have been commonly referred to the *Notodontidae*,* and the pyralid genus *Coenodomus*, Walsingham. To this list I now have the pleasure of adding a liparid moth from tropical West Africa, for which I propose the generic name *Oecura*, and which I shall specifically designate by the name of its discoverer, the earnest and talented explorer, Rev. Dr. Good, to whom I have in recent

years been indebted for many notable acquisitions to my collection. I also append the description of two new species of *Anaphe*, from the tropical West Coast of Africa, *A. clara*, mihi, and *A. subsordida*, mihi (*vide infra*).

The first reference which I have been able to find to the curious habit to which I have made allusion is in an article communicated by Dr. Ch. Coquerel to the Entomological society of France at its meeting held Dec. 13, 1854, and published in the *Annales* for the year 1855.† He alludes to the great cocoons as well known objects, "On connaissait depuis longtemps ces grandes poches de soie qui garnissent souvent toutes les branches principales de plusieurs arbres de Madagascar appartenant pour la plupart à la famille de Légumineuses (*Sutria* ‡ *Madagascariensis*, *Mimosa Lebbek*, etc.) mais on n'avait jamais décrit les insectes qui forment ces cocons, avec

† Observations entomologiques sur divers insectes recueillis à Madagascar. 5me partie. Par M. le Dr. Ch. Coquerel, *Annales de la Soc. ent. de France*, 3me serie, vol. iii, p. 529 et seq.

‡ *Intsia Madagascariensis*. "*Sutria*" is a misprint.

* Probably more correctly referred to the *Liparidae*.

lesquels les Malgaches tissent des étoffes remarquable par leur éclat et leur solidité." He informs us that the caterpillars of *Bombyx* (*Hypsoides*) *Radama*, Coq., live after the manner of the common European processionaries, and after having woven in common an enormous pouch which is often several feet in length, each forms in its interior an individual cocoon, and there undergoes the final transformation. The species described by Coquerel in this paper are *Hypsoides Radama*, and *H. Diego*, and *Anaphe Panda*, Boisd., the latter from Natal, in reference to which Mons. Coquerel remarks that it has the same larval habits as the two Mascarene species, and that its silk is employed in the same way by the natives of the country in which it is found. Subsequently, in 1863, Dr. Coquerel and Mons. A. Vinson published another paper upon this subject in the Bulletin de la Société d'acclimatation et d'histoire naturelle de la Réunion, and followed it in 1866 by a paper in the Bulletin of the French Société d'acclimatation. The last article by Dr. Coquerel which treats of the subject is contained in the Annales of the Entomological society of France for 1866, having been presented at the meeting of the Society held in July of that year. This article is accompanied by a plate representing the cocoons and outer cocoon-bag woven by *H. Radama*. Meanwhile in 1859 Mr. A. W. Scott published in the Proceedings of the Zoological society of London a paper in which he described a moth found in New South Wales, which is referred to

the Hyponomeutidae, and to which he gave the name *Hyphantidium seri-cearium*. The social habits of the larvae of this insect are remotely related to those of the Mascarene insects described by Coquerel. The paper of Mr. Scott is accompanied by a plate giving anatomical details of *Hyphantidium*. For seventeen years after the publication of the last paper by Coquerel, or from 1866 to 1883, nothing appears to have been added to the literature of this interesting subject, though Mr. A. G. Butler in 1877 and again in 1878 described a species of *Anaphe*, the former from Ambriz, and the latter from Old Calabar; and in 1882 erected the genus *Hypsoides* for the reception of *H. bipars*, a new species from Madagascar, strictly congeneric with *Bombyx Radama*, Coq., and *Bombyx Diego*, Coq. In 1883 Carl Fromholz published an article in the Berliner entomologische zeitschrift (Band xxvii, pp. 9 *et seq.*), in which he gives an interesting account of the larval habits of *Anaphe panda*, Boisd., based upon material which had been presented to the entomological museum at Berlin by the German savant and traveller, Dr. Fischer. The paper is accompanied by a plate upon which the larva and the cocoon-bag of *A. panda* are depicted. According to the information given by Dr. Fischer the natives of the region about sixty miles inland from Dar-es-Salaam, where the cocoons were obtained, report that the caterpillars occupy the nest, which they weave as a common home, for two years before

emerging as moths. The nests, according to the same authority, are collected by the blacks, and in times of want are added to the stores of the native larder.

The next contribution to the literature of the subject is the masterly article by Lord Walsingham published in the Transactions of the Linnean Society for the year 1885, founded largely upon material communicated to the writer by Col. J. H. Bowker. This article is profusely illustrated, and Walsingham describes and figures two new species of the genus *Anaphe*, *A. infracta* and *A. carteri*. According to information given Lord Walsingham by Col. Bowker, the natives of South Africa use the silk of the cocoon-bags in cases of injury very much as oiled silk is used by surgeons in more civilized lands. Lord Walsingham followed his paper upon the genus *Anaphe* by a paper published in the Transactions of the Linnean Society for 1887 upon *Coenodomus Hockingii*, Wls., a curious pyralid moth found in the Punjab, which has larval habits somewhat closely allied to those of the African genera *Anaphe* and *Hypsoides*. This paper is accompanied by a most excellent plate, giving full details.

In 1888 Mr. H. Druce described in the Proceedings of the Zoological society of London a new species of *Anaphe* from Gambia, which he names after its discoverer, *A. Moloneyi*. Mr. Druce says that the cocoon of this species, which had been presented to him by Capt. Moloney, was "almost the shape of a large pear, about five inches long, and

was found hanging from the branch of a tree by a fine silken thread." He also notes the fact that he had recently received from Mr. A. Higgins a specimen of the cocoon of *A. infracta*, Wls., obtained at "Ile Ife, about fifty miles inland from Lagos, where they are very common, hanging from trees." He adds "The natives eat the larvae, which are of a reddish brown color; they fry them in palm-oil. Mr. Higgins informs me that they are of a sweetish taste when cooked. They also make use of the silk, taking it from the cocoons, washing it, and forming it into hanks, which they sell in the market-places; it is also made into rough cloths by the women." The cocoon given to Mr. Druce by Capt. Moloney yielded Mr. Druce about sixty moths, and I am personally indebted to him for a fine suite of this species now in my collection. Thus far I have not received any specimens of *Anaphe infracta* from any of those persons, who have collected for me upon the West African coast south of Cape Lopez, but I have received several cocoons of *A. Moloneyi*, from one of which, represented in the plate, about eighty moths had emerged previous to shipment. The last cocoon sent me was delayed in transit, and upon opening the tin box containing it, I found the remains of a large number of moths which had emerged and perished upon the journey.

The cocoons of *A. Moloneyi* which I have received have not been suspended by a thread of silk, but are firmly fixed among the outer twigs of branches. The

cocoon represented upon the plate is $6\frac{1}{2}$ inches in the major, and $3\frac{3}{4}$ inches in the minor diameter. The cocoon of *Oecura Goodii* depicted upon the same plate is flattish and was found attached to the trunk of a tree, and superficially in form and color strikingly resembles a reddish brown fungoid growth. It is $6\frac{3}{4}$ inches long and $4\frac{1}{2}$ inches wide upon the longest diameters, and at the deepest point in the middle not more than 1 inch thick. Dissected across the middle its section presents the form of an arc, the chord of which represents the base by which it was attached to the bark of the tree. The inner cocoons are less than an inch in length and about one-third of an inch in diameter, and are arranged with the longer axis in a position vertical to the base in the middle, and as the outer circumference is reached with the longer axis sloping inwardly, while just at the edge a few cocoons are disposed horizontally to the base. The cocoons are very compact, and imbedded in layers of soft silk. The outer investiture or covering is composed of several distinct layers and superficially is smoother and more compact than in the cocoon of *A. Moloneyi*. When the insect emerges from the inner cocoon it has also to force its way out through the tissues of the external envelope, which yield to the advance, but close again, leaving hardly any trace of the perforation. There is no common passage for exit.

It is worthy of note that these insects appear to be peculiarly subject to the attacks of parasitic enemies. Fromholz

describes a lepidopterous parasite to which he gives the name *Zophodiopsis hyaenella*, and which from the description and figure I judge to be identical with the insect described by Coquerel in 1885 as *Chilo carnifex*. The same insect is found upon the West African coast. Walsingham figures a Tachina, *T. Onchestus*, Walk., which preys upon the larvae. I have a series of Tachina which emerged from the cocoons figured upon the plate, but which do not appear to be identical with the species named by Walker.

I append some extracts from the notes sent me by Mr. Good.

No. 100. (*Oecura Goodii*, Holl.)

"March 7th, 1891. Seven days ago, March 1st, my boy returned from down river with the queer object labelled No. 100. He found it attached to the trunk of a tree and pulled it off. Three days ago I saw it first, and pulled off one of the cocoon cells. Cutting it open I found a caterpillar about half changed to a chrysalis. They must only have just spun up when they were discovered.

May 9th. Three moths came out in the box in which this "comb" of cocoons was kept. I thought they came from it, but I could only find very small rents in its face, so I waited for more to emerge. No more came out till May 11th, when, to make certain that they had not come from something I had forgotten in the ground at the bottom of the box in which they were, I turned out all the earth.

May 19th. Today two more of these

moths came out, but one had damaged itself.

May 22nd. Another moth emerged.

May 23rd. Another moth hatched.

May 30th. Another moth has come out.

A large number of flies, not moths, (*Tachina*), also came out of this mass of cocoons, each one of which had of course destroyed a chrysalis. Two of these I send pinned and numbered 100."

No. 121. (*Anaphe Moloneyi*, Druce.)

"Sept. 29th, 1891. This morning a native brought me the cocoon numbered 121. I have seen several similar cocoons before. I supposed this to have been spun up by a single very large caterpillar. I bought it and laid it down on my table till I could finish what I was doing, when the boys called to me, and pointed out that a moth had come out, and there it was, creeping up the wall, where it finally settled in order to allow its wings to develop. I now realize that I have another multiple cocoon like No. 100. There must be a number of species which spin such cocoons, for I have seen several others like this one but differing in important particulars.

Oct. 5th. Four more of the moths have hatched.

Oct. 6th. Three more came out today. I remark that all of these moths so far have emerged from the cocoon between 9 and 10 A.M. All African butterflies come out in the morning from the chrysalis, and all moths so far as I have observed in the afternoon, or during the

night. I at first thought these might be day-flying moths, but they seem not to be, as they do not stir all day long. As was the case with No. 100, so here, a great many flies are emerging from this cocoon. I should say two flies come out for every moth. I send a couple of them pinned and numbered 121." (They are of the same species as that which emerged from the cocoon of *Oecura*.)

"Oct. 24th. The flies have ceased to emerge, but the moths are still coming. At first mostly males came out, then males and females, later only females. Three or four days ago I thought all the moths were out. All had apparently come out of one side, that from which the twigs project, and I supposed that these were all that the nest contained. But a day or two ago they began to come out from the other side and today four emerged, all males. I suppose the females will come later." From the dates on the envelopes it is plain that this surmise was correct.

It only remains to be said that in the economy of these insects we have a wonderful illustration of instinct, scarcely less remarkable than that displayed by the bee, and especially wonderful because exhibited by the insect in its larval, and therefore immature, state.

OECURA,* *gen. nov.*

Palpi minute, porrect, compressed, heavily clothed with short hairs, the third joint short and clothed with hair to its tip, and almost lost in the hairy vestiture of the second joint.

* *Oucoupa* = *Domi rectrix*.

The antennae of the male are moderately short, heavily pectinated, of the female equally long but less heavily pectinated. The pectinations are margined on both sides with delicate hairs and have a spur on the outer edge near the extremity. The legs are hirsute with two spurs upon the tibiae of the last pair. The abdomen in the male has two minute tufts upon the dorsal line back of the thorax. The radial on the primaries and the secondaries springs from near the bottom of the cell. The primaries are subtriangular with the costa very moderately convex, or nearly straight for two-thirds of the distance from the base with the apex rounded and the outer margin evenly convex, the inner angle is rounded, and the inner margin slightly convex before the base. The secondaries are sub-pyriform with the outer margin evenly rounded. The prevalent coloration is obscure brown and gray. The larva is characterized by the habit of forming social cocoons, a multitude of individuals weaving a common covering of silk, which is applied to the trunks of trees and similar situations and presents the appearance of a fungoid growth, within which each larva weaves a smaller cocoon in which it undergoes final transformation.

Oecura Goodii, sp. nov. ♂. Palpi, front and collar dark brown. Antennae testaceous. The patagiae are brown margined externally and internally by a few grayish hairs, or scales. The upper part of the abdomen immediately back of the thorax is grayish, the remainder of the abdomen is pale brown with an ochraceous tint on the sides. The underside of the thorax and the abdomen is obscure ochraceous. The legs are brown with the tibiae and tarsi annulated with whitish. The primaries are dark brown with some greenish-gray markings near the base, a broad greenish-gray spot on the inner margin near the middle succeeded by a transverse crenulate limbal line of black. The margin is marked on the interspaces with greenish-gray spots,

which increase from the apex as far as the third median nervule, then diminish and widen again to the outer angle, which is whitish. These spots are all marked on the middle by a narrow dark line. The fringes are dark brown checked with pale gray at the ends of the nervules, but at the outer angle the fringe is whitish. The secondaries are fuscous with an obscure discocellular mark and a submarginal transverse band. The fringes are as on the primaries from the outer angle to just before the anal angle, at which they are uniformly gray. The under side is pale fuscous with the middle area of the primaries clouded with pale fuliginous. Both wings have an obscure discal dot at the end of the cell. Both are traversed from the costa by an incomplete brownish transverse median line. The primaries have in addition a parallel transverse submarginal band.

♀. Female almost exactly like the male but larger. Expanse, ♂, 33 mm.; ♀, 45 mm.

ANAPHE, Walk.

A. clara, sp. nov. ♂. Very like *A. Moloneyi*. Druce, but readily distinguished from that species by the fact that the nervules are not black at their extremities upon the upper side, and by the fact that on the lower side the primaries have the cell clouded with chocolate and the apex as far as the third median is heavily marked with blackish scales. There is also a dark brown mark upon the secondaries at the middle of the costa. The species is also prevalently smaller in size than *A. Moloneyi*. Expanse ♂, 30 to 40 mm.; ♀, 65 mm.

A. subsordida, sp. nov. ♀. Allied to *A. Moloneyi* but with the wings narrower and more elongate, having but one transverse black line which is connected with the dark outer margin by a heavy black ray running along the radial and by a similar black ray on the extremity of the first median nervule. On the under side the markings of the upper side reappear, but almost the entire apical

area enclosed between the transverse line and the radial ray is dark reddish-brown. In addition to the two rays of the upper surface, there is a dark ray upon the lower side upon the second median. Expanse ♀ 55 mm.

EXPLANATION OF PLATE 9.

Fig. 1. Cocoon-bag of *Oecura Goodii*, Holl. The dotted line indicates a portion removed for purposes of dissection.

Fig. 2. Cocoon-bag of *Anaphe Moloneyi*, Druce.

Fig. 3. *Oecura Goodii*, ♂, sp. n.

Fig. 4. *Oecura Goodii*, ♀, sp. n.

Fig. 5. *Anaphe clara*, ♂, sp. n.

Fig. 6. *Anaphe subsordida*, ♀, sp. n.

Fig. 7. *Anaphe moloneyi*, ♀, Druce.

Fig. 8. *Anaphe infracta*, ♀, Wls.

ON THE ATTRACTION OF LIGHT FOR THE TWO SEXES OF COLEOPTERA.

BY HENRY FREDERICK WICKHAM, IOWA CITY, IOWA.

Referring to the capture of moths, Dr. A. S. Packard writes, in a foot-note on page 246 of his "Entomology for Beginners," "It is a curious fact that in general the males alone are attracted to light; the same is probably true of beetles, especially the June beetle." As this statement does not agree very well with my own experience in collecting Coleoptera I have been led to go over a portion of my material and embody the results in the following table. With the exception of the specimens from Tucson, which were taken at street gas-lamps, all were captured at electric light.

Fifteen sets of insects have been examined. These are numbered in the table and I have subjoined the locality in which each was taken as I find that a set from one locality will give a different proportion of a certain sex than that from another. With the imperfect data at hand it is impossible for me

to determine what relation the date of capture may have to the proportion of either sex (since it sometimes happens that one sex appears somewhat earlier than the other) and I leave this for future studies. As a rule only a few days were spent at any one collecting point and the set of each species represents the work of two or three consecutive evenings, never of more than a week.

The insects have been taken at random from several different families, chiefly using genera, however, in which the male secondary sexual characters are sufficiently well developed to enable the sexes to be separated without too much trouble or chance of error.

Of these sets, those marked 1, 3, 9, 12 are from Tucson, Arizona; 2, 4, 5, 10, 15, from Albuquerque, New Mexico; 13, 14, from Spokane Falls, Washington, all collected by myself. The remainder are from Lincoln, Nebraska

and were kindly given me by Professor Shimek.

Set Number.	No. examined.	No. of males.	No. of females.	Percentage of males.	Percentage of females.
1. <i>Tetracha carolina</i> .	35	27	8	77.1	22.9
2. <i>Cicindela sperata</i> .	50	24	26	48.	52.
3. <i>Cicindela lemniscata</i> .	55	35	20	63.6	36.4
4. <i>Bledius armatus</i> .	10	3	7	30.	70.
5. <i>Lachnosterna longitarsis</i> .	9	5	4	55.6	44.4
6. <i>Lachnosterna fusca</i> .	150	108	42	72.	28.
7. <i>Lachnost. crassissima</i> .	26	13	13	50.	50.
8. <i>Lachnosterna hirticula</i> .	20	17	3	85.	15.
9. <i>Cyclocephala</i> (mixed set).	45	36	9	80.	20.
10. <i>Cyclocephala immaculata</i> .	18	6	12	33.3	66.7
11. <i>Cyclocephala</i> "	100	0	100	0.	100.
12. <i>Chalepus obsolietus</i> .	130	33	97	25.4	74.6
13. <i>Ergates spiculatus</i> .	49	17	32	34.7	65.3
14. <i>Prionus californicus</i> .	108	58	50	53.7	46.3
15. <i>Macrobasis atrivittata</i> .	25	18	7	72.	28.

In eight cases we find a preponderance of males; in six the females are more numerous, while in one case an equal number of each sex is found. In no instance is the set composed entirely of males, though the reverse has occurred once, and in a very large series.

It is worthy of note that many species which are usually considered strictly

diurnal in habit are attracted a long distance by light—as, for example, a number of *Cicindela*. Of the genus *Cicindela* I have taken *lepida*, *punctulata* and *praetextata* in such situations as well as the two mentioned in the table. No rule can be formulated in this case as to the attraction exerted on each sex—sometimes the males are more numerous, sometimes the females.

Several genera of Scarabaeidae, not here tabulated, show a varying proportion of females. *Cheiroplatys clunalis*,* which appears in our Check-list under three specific names under the genera *Aphonus* and *Orizabus*, furnishes about equal numbers of each sex. *Polyphylla* is chiefly seen in the male sex and the same is true, so far as my experience goes, of *Plectrodes*.

It will be seen, then, from the foregoing notes, that captures of Coleoptera at light need by no means be confined to males only and that it can hardly be stated as a general rule that these alone are attracted.

LEPIDOPTEROLOGICAL NOTES. — It will please our readers to hear that Mr. W. H. Edwards has received a grant of \$500 from the Bache Fund of the National academy of sciences to complete the publication of his researches into the life histories of American butterflies.

One of the most zealous collectors of Indian Lepidoptera has been Col. Knyvett, who for many years has been in charge of the police forces in the province of Bengal and has utilized the native policemen in his entomological labors. His entire collection, numbering over 700 species of rhopalocera in splendid suites and nearly 2000 species of heterocera in equally fine suites, about 10,000 specimens,

has been purchased at the suggestion of Dr. Holland by Mr. Andrew Carnegie. They will be under Dr. Holland's care and ultimately be placed in the museum which Mr. Carnegie is building in Pittsburgh, Penn. The specimens have all been examined and named by the most eminent English specialists, Elwes, Hampson, Warren, Myrick and Butler.

Blatchley records 108 species of Indiana butterflies in a catalogue published in the 17th report of the state geologist, 1892.

* For the synonymy of this species see Mr. H. W. Bates in *Biologia Centrali-Americana, Insecta, Coleoptera*, Vol. II, part 2, p. 321.

(Continued from page 376.)

secondaries are pale yellowish red, of the same tint as the upper surface of the secondaries. The outer two-thirds of the primaries are fuscous. The hyaline spots reappear upon the lower side of the primaries without any modification in form. The legs and lower side of the body are uniformly of the same pale red color as the adjacent wing surfaces. The antennae are light brown tipped with pale amber-yellow. The eyes are black. Expanse, 40 mm.

This is one of the most beautiful species of the genus. My specimen was taken on the shores of Lake Onanga, and is unique.

17. *S. leucogastra*, sp. nov. ♀. Antennae black, very minutely tipped with white. Lower side of palpi, pectus, tibiae, and tarsi orange-rufous. Front, collar, tegulae, lower side of thorax, and upper side of both thorax and abdomen black. The lower side of the abdomen is broadly pure white, and the upper side of the anal extremity bright orange. There are also a few small vermilion spots upon the upper side of the abdomen on the median line, and on either side just behind the thorax. The wings are deep black. There are four pellucid spots upon the primaries, a square one at the end of the cell and a smaller one below the cell nearer the base, a small oval spot beyond the cell near the costa and a larger round one below this. Upon the secondaries there is an exceedingly minute translucent spot at the end of the cell. Expanse, 26 mm.

18. *S. cytogaster*, sp. nov. ♂. Antennae strongly pectinated, abdomen compressed behind the thorax. Possibly referable to the genus *Glaucopis*. The wings are marked exactly as in *S. miserabilis*, Holl. The front, a spot on each side of the thorax at the base of the primaries, a spot on the median line of the upper side of the abdomen just behind the thorax, the pectus, the tibiae, and the lower side of the constricted portion of the

abdomen and the outer edges of the remaining segments of the abdomen on the under side are all white. The end of the abdomen is tufted with white hairs. Expanse, 18 mm. Habitat Talaguga, August.

19. *S. cybelistes*, sp. nov. ♀. Allied to *S. constricta*, Butl., but the primaries are more acute at the apex, and all the translucent spots are greatly reduced in size because of the widening of the intervening black portions of the wing. The outer margin and the costa of the secondaries are broadly black, while in *S. constricta* they are narrowly black. There is furthermore a large triangular white patch on the outer margin of the primaries below the apex. There is but one white ring on the abdomen behind the thorax, the white ring which is found in *S. constricta* toward the end of the abdomen being wanting in the present species. Expanse, 28 mm.

20. *S. creobota*, sp. nov. ♂. Allied to *S. cerbera*, Linn., but not so robust. Antennae white at the tips. The primaries are marked as in *S. cerbera*, except that they are not white at the apices. The secondaries are more acute at the outer angle, and the translucent spots relatively smaller than in *S. cerbera*. The thorax at the base of both wings on the under side has an orange spot, and the upper side of the abdomen is solid orange-red from the thorax to the fourth segment from the end, except on the middle ventral line of the under side, which with all the rest of the body is blue-black. The tibiae are margined with white. Expanse, 28 mm.

21. *S. crenophylax*, sp. nov. ♂. Allied in general outline to *S. leucogastra*. Antennae moderately pectinated. Front and pectus white. Collar, a spot on the lower side of the thorax on each side at base of the primaries, and the entire lower side of the abdomen bright orange-red. The upper side of the thorax is black. The abdomen upon the upper side is ringed with bright shining green next to the thorax, this green band is

followed by a black band, and this is succeeded by a crimson band and the end of the abdomen is bright shining green. The wings are translucent. The primaries have the costa and the outer margin narrowly margined with black, and the inner margin more heavily margined with the same color, the border here being produced in the direction of the cell about the middle of the margin. The discocellular and the radial are heavily marked with black. The secondaries on the costa are heavily, and on the outer and inner margins narrowly, bordered with black. Expanse, 22 mm.

SYRINGURA,* gen. nov.

Allied to Syntomis. Palpi exceedingly minute, appressed, the terminal joint porrect. Haustellum half as long as the body. Antennae long, terete, swollen before the tip, pointed. Tibiae without spines. Abdomen cylindrical, stout, with the last segments compressed and forming a short, narrow, tubiform appendage. Anterior wings produced, subtriangular, with the costa rounded at base, very slightly concave at the middle, and curved before the apex. The apex is pointed and the exterior margin moderately convex. The posterior wings are elliptical with the outer angle acute. The anterior wings are ornamented with transparent spots. Type *S. uranopeles*, Holland.

22. *S. uranopeles*, sp. nov. ♂. Antennae black, margined with white on the lower side for a short distance before the tips, which are black. The entire body and legs are blue-black. The wings are black glossed with brilliant morpho-blue. The anterior wings on the upper side are ornamented with three moderately large spots arranged in a triangle beyond the middle of the wing, one on the end of the cell, another just below the extremity of the cell, both hyaline, the third before the apex inlaid with brilliant blue

scales. The basal area of the secondaries is hyaline. The lower side of the wings is much as the upper, save that there is a subquadrate spot of bright blue on the costa of the secondaries before the outer angle. Expanse, 32 mm.

MELISA, Walk.

23. *M. grandis*, sp. nov. ♀. The primaries above are deep black shading on the outer half into deep violet-blue, which in certain lights reflects a green lustre. The secondaries are uniformly deep blue-black. Upon the under side both primaries and secondaries are uniformly deep black. The antennae, the thorax above and below, and the upper side of the abdomen are black, as are also the coxae and trochanters. The femora, tibiae and tarsi are pink, the lower side of the abdomen is luteous, tinged with pinkish near the thorax, the end of the abdomen is furnished with a large brush of crimson hairs. The black segments of the abdomen have the position of the spiracles indicated by minute yellow spots, and the third, fourth, fifth, and sixth segments from the thorax each have in addition two large yellow spots, one on either side. Expanse, 55 mm.

There is a specimen of this species in the British Museum unnamed.

ARCTIIDAE.

APISA, Walk.

24. *A. cinereo-costata*, sp. nov. ♂. Very near *A. canescens*, Walk., but differs in being smaller, and in having the costa of the primaries narrowly bordered with brown. The posterior wings are also pure white, which they are not in *A. canescens*, the type of which I have compared with the species before me. Expanse, 25 mm.

25. *A. cana*, sp. nov. ♂. Uniformly pale slaty grey, with the upper side of the

*Συρίγγ = tuba, Ουρα = Cauda.

thorax, the palpi, and the forelegs darker grey. Near *A. canescens*, Walk., but different as is shown by comparison with the type of Walker's species.

♀. Like the male, but larger, and with much heavier body.

Expanse, ♂ 30 mm; ♀ 37 mm.

ANACE, Walk.

26. *A. parachoria*, sp. nov. ♂. Allied to *A. perpusilla*, Walk., but quite different. The prevalent color of the upper side of the body and wings is obscure ferruginous. The primaries are marked by four pale yellow spots arranged in transverse series of two spots, one discal and the other subapical, the spots nearest the costa being in each series the smallest. The basal and limbal area of the secondaries is also pale yellow. The abdominal segments near the thorax and at the end of the abdomen are margined laterally with pale yellow bands. The underside of the wings is much as the upperside. ♀. This sex is characterized by being much larger in size, and by having the yellow area of the secondaries restricted to a small spot at the end of the cell. Expanse, ♂ 22 mm; ♀ 30 mm.

27. *A. monotica*, sp. nov. ♂. Antennae pale grey with the setae blackish, the upper side of the body is cinereous, with a pale annulus about the abdomen after the thorax. The underside of the palpi and of the thorax is whitish. The primaries are uniformly ashen grey except a large subtriangular spot which is pale yellow and extends from the costa before the base not quite to the inner margin. The secondaries are pale yellow, with the outer third ashen grey as the primaries. Upon the under side the basal third of the primaries and the entire secondaries are pale yellow, or whitish in some specimens. Expanse, 23 mm. There is an example of this species in the British Museum unnamed.

METARCTIA, Walk.

28. *M. paremphares*, sp. nov. ♂. Allied to *M. inconspicua*, Holl. (Entomologist, Sept., 1892). It differs, however, in the absence of the reddish color which prevails in that species upon the head and collar, and in the fact that the costa of both wings and the apical third of the primaries on the under side is dark brown. The head, thorax, and primaries above are dark ashen gray, the secondaries are uniformly white, the upper side of the abdomen is reddish ochraceous. The under side of the abdomen is dark brown, the wings are white, except upon the costae and upon the outer third of the primaries which are dark, like the upper side of the primaries.

♀. The female differs from the male in being larger and in having the secondaries slaty grey above and below except upon the inner margin of the under side. The primaries also are uniformly grey below, except just at the base, where they are whitish. Expanse, ♂ 28 mm; ♀ 35 mm.

29. *M. benitensis*, sp. nov. Allied to the preceding, from which it differs in having the upper side of the abdomen dark smoky brown as the primaries, and the secondaries of the same color as the primaries, and the under side throughout of the same tint as the upper surface of the primaries, or merely a shade lighter in some specimens. Expanse, ♂ 30 mm; ♀ 38 mm. Habitat, Benita.

30. *M. paraclecta*, sp. nov. ♀. Allied to the common *M. erubescens*, Walk., but differs from it in being prevalently bright red, whereas Walker's species is ochreous, shading into red upon the body and secondaries. In the style and location of the markings it does not differ from Walker's type to any great extent, but very markedly in its color. The posterior wings are uniformly pale vermillion. The primaries are of the same color with the nerves and the spots on the discal

area bluish grey. The front and the palpi are bright red. The entire body and the entire under side of both wings are uniformly pale vermillion. Expanse, 35 mm.

31. *M. haematica*, sp. nov. ♂. Uniformly dull reddish, with the costa of the primaries, the upper side of the thorax, the front, and the forelegs brownish. The antennae are whitish. Expanse, 28 mm.

32. *M. haematosphages*, sp. nov. ♂. Antennae white. The upper side of the thorax is dark red. The upper side of the abdomen and of both primaries and secondaries are rich red, with the nervations faintly marked with brown. The outer margins are narrowly fringed with dark brown. The under side of the body is pale red. The under side of the wings are reddish clouded all over except upon the inner margin of the primaries with fuliginous scales. Expanse, 35 mm.

32. *M. lutea*, sp. nov. ♀. Uniformly luteous throughout, except that the nervures on the upper side of the primaries and the outer margins of these wings are narrowly marked by greyish lines. Expanse, 35 mm.

33. *M. haematoessa*, sp. nov. ♀. Antennae whitish. Head, palpi and upper side of thorax dark brown; abdomen reddish ochraceous. *Upper side.* The primaries are red thickly irrorated with fuscous. The fringes are fuscous. The wing is ornamented by five moderately large light red spots, one in the middle and another at the end of the cell, two smaller ones without the cell at the origin of the first median nervule. The secondaries are uniformly pale orange red. *Under side.* The under side is a smoky brown except at the base and inner margin of both wings, which are pale orange-red.

There are no spots on the under side, but the nerves are dark fuscous and clearly defined upon the ground color. Expanse, 45 mm.

BALACRA, Walk.

34. *B. glagoessa*, sp. nov. ♂. The antennae, front, patagia, the upper side of thorax, and the upper and lower side of abdomen are white. The eyes are black. The top of the head, the pectus, and the inner margins of the trochanters and femora are crimson. The wings are white both above and below and the primaries at the end of the cell and in the intra-neural spaces adjoining the end of the cell are translucent. ♀. The female is like the male. Expanse, from 42 to 45 mm.

This magnificent species is apparently quite common on the upper waters of the Ogové River.

35. *B. rubricincta*, sp. nov. ♂. The antennae are white. The front and the lower side of the thorax are crimson. The collar is white margined with crimson. The patagia are crimson margined with white. The thorax and the abdomen are crimson with the segments margined with white on the upper surface. On the under side of the abdomen, which is white, there is a double row of crimson lunular marks, four in each series. The legs are white margined with crimson. The costa of the primaries is narrowly white. The rest of the wing is saffron. There is a white spot near the inner margin upon the submedian nervule. The intra-neural spaces adjoining the extremity of the cell are semi-diaphanous. The posterior wings are pale crimson narrowly margined with white. The under side of the wings is as the upper side but paler. Expanse, 43 mm.

36. *B. damalis*, sp. nov. ♂. Front, palpi, lower side of thorax, and inner edges of femora and tibiae crimson. Eyes black. Collar pure white. The upper side of thorax and abdomen fawn colored, with the inner edges of the segments of the abdomen bordered laterally with black. The lower side of the abdomen is white with some crimson markings near the base. The primaries are fawn colored, with a spot at the end of the cell, and the intraneural spaces beyond it transparent. The posterior wings are saffron, tinged on the inner margin with crimson. The lower side of the wings is as the upper side.

♀. The female does not differ in markings from the male.

Expanse, 42 mm. Habitat, Benita and Kangwé.

37. *B. haemalea*, sp. nov. ♂. Antennae and eyes black. The entire body deep crimson. The fore wings are dull bluish-green marked with crimson. There is a crimson streak at the base near the costa, a spot at the end of the cell and one below it, a spot beyond the end of the cell, and the entire outer margin shades into crimson between the nervules, which are blue-gray. The fringe is blue-gray. The posterior wings are rosy, palest on the costa. The wings on the under side are pale red with the fringe and the apex of the primaries dull blue-gray.

Expanse, 45 mm. This splendid species is allied to *B. flavimacula* Walker, but is totally distinct.

CASPHALIA, Walker.

38. *C. nigerrima*, sp. nov. ♂. Head and antennae black. The collar is black narrowly edged in front with orange. The pectus and outer margins of the legs and the lower side of the abdomen are orange. The abdomen has the inner edges of the segments upon the lower side bordered with black. The tegulae are snow white tipped with black. The upper side of the thorax and ab-

domen are jet black. The primaries are black, the secondaries dark brown, paler near the base.

The under side of the wings is as the upper side.

Expanse, 40 mm.

NOTE.—The genus *Casphalia* was erected by Walker in 1866, for the reception of a species which he named *C. flavicollis*. This genus has been placed by Mr. Kirby in his recent catalogue among the Pinaridae. In 1887 Mr. Druce described a species as *Anacis herpa*. A comparison of Walker's type and of the insect described by Mr. Druce shows that they are congeneric. The genus includes, therefore, three species as follows:

1. *C. flavicollis*, Walker.
2. *C. herpa*, Druce.
3. *C. nigerrima*, Holland.

CREATONOTUS, Hübn.

39. *C. leucanioides*, sp. nov. ♂. Upper side of thorax, front, and palpi very pale fawn color. The upper side of the abdomen is crimson. A black line runs from the front to the middle of the thorax, and there is a line of black spots on the middle of the upper side of the abdomen. The underside of the body and the legs are dark brown. The wings are white and semi-diaphanous with a very narrow black ray running along the lower edge of the cell of the primaries succeeded by a black dot at the end of the cell at the origin of the radial and followed by another small black dot on the radial near the outer margin. The costa and the outer margin of the primaries are slightly tinged with luteous. Under side like the upper, but paler.

♀. The female is like the male.

Expanse, 38 mm.

ALPENUS, Walk.

40. *A. (P) aurantiaca*, sp. nov. ♀. The upper and under sides of the body tawny-orange with a row of black spots on the dor-

sal line of the abdomen, and a row of very minute black spots on either side. The legs are concolorous with the tibiae margined with black. The primaries on the upper side are of the same color as the abdomen and have two very faint and much angulated parallel transverse lines crossing them beyond the cell, and a few black spots on the outer margin near the end of the radial nervule. The secondaries are much paler, inclining to whitish. The under sides of both wings are pale creamy tinged on the costa with reddish, and there are a few indistinct black marks at the outer angle of the secondaries as well as upon the outer edge of the primaries opposite the cell, and both primaries and secondaries have a very small and obscure discal dot. Expanse, 40 mm.

This insect is with doubt referred to the genus *Alpenus*, as likewise the following species, though they come nearer that genus than any other.

41. *A. (P) multiscrita*, sp. nov. ♂. Antennae, front, collar, tegulae, and abdomen pale yellowish. The tegulae have each a black spot in the middle, and there is a row of black spots on the dorsal line of the abdomen, and a row of very minute black spots on either side of the abdomen. The legs are yellowish margined with brown. The primaries are of the same color as the thorax and profusely sprinkled with very minute brownish lines running transversely. On the costa beyond the base, there is a narrow dark brown line reaching into the cell; beyond it a heavy brown line running obliquely toward the outer margin to the end of the cell, and then returning at a very acute angle and terminating upon the inner margin before the base. A subapical brown line runs from the costa inwardly, and then is connected by a curved line with the upper portion of the angulated line, which precedes it. There is a submarginal line about three-fourths of the distance from the base, which is heaviest near the inner margin. There is a series of black

dots on the outer margin most distinct just below the apex. The posterior wings are white with a very faint discal dot and a few black dots at the outer angle. The under side is uniformly pale yellowish with a heavy comma-shaped discal mark upon the primaries, and a heavy round discal dot upon the secondaries. Both wings have some obscure grayish marks near the outer end of the costa and the outer margins are punctured with black dots.

Expanse, 28 mm. This species is apparently not uncommon.

ALOA, Walk.

42. *A. nigricosta*, sp. nov. ♂. Antennae white with the pectinations gray. Front orange. Collar and upper side of the thorax yellowish-white. The abdomen orange with a heavy black dorsal line, a row of black dots on either side of the abdomen and a double row of black dots on the lower side of the abdomen. The wings are yellowish-white inclined in the case of the secondaries to semi-translucency, and the costa of the primaries from about the middle to the apex is heavily margined with black.

Female like the male.

Expanse, ♂, 30 mm.; ♀, 36 mm.

CYMBIDAE.

EARIAS, Hübn.

43. *E. Ogovana*, sp. nov. ♂. Front and forward edge of collar white. Eyes and antennae brown. Palpi pale fulvous. Lower side of thorax and abdomen whitish. Legs whitish margined with brown. The hind margin of the collar, the upper side of thorax, and upper side of anterior wings bright grass-green. The upper side of the abdomen is pale brown annulated with black. The posterior wings are vinaceous with the costa shining whitish and the fringes on the outer margin darker than the body of the wing. The anterior wings are crossed by two angulated

transverse exceedingly fine median lines. The under sides of both wings are vinaceous. The anteriors whitish on the costa near the apex and broadly whitish on the inner margin. There is a small dark brown spot on the costa of the primaries a little beyond the middle. Expanse, 20 mm.

LITHOSIIDAE.

CABARDA, Walk.

44. *C. torrida*, sp. nov. ♀. Antennae, front, collar, and thorax white. Legs pale yellow. Abdomen gray. Upper side of anterior wings milk-white with two small oval pale fawn spots arranged longitudinally in the cell beyond the middle, a small spot of the same color at the base, a moderately large brown blotch below the cell near the middle tapering inwardly toward the base, and a limbal band broadest near the posterior margin. The apex broadly fawn color with a series of small spots of the same color on the outer margin between the nervules, gradually diminishing in size toward the outer angle. The posterior wings are very pale semi-translucent fawn color. The under side of both wings is of the same color as the upper side of the secondaries. The costa and the outer and inner margins of the primaries are paler.

Expanse, 20 mm. Habitat, Benita. (February.)

45. *C. temperata*, sp. nov. ♂. Allied to *C. frigida*, Walk. The under and upper sides of the body are white. The primaries are dull white with the outer half heavily covered with rusty scales shading into blackish near the outer margin. On the costa before the apex, and on the outer margin just below the apex, this ferruginous tract is indented by two subtriangular pure white spots. The posterior wings are grayish, darkest near the outer margin, and the fringes of both primaries and secondaries are whitish. On the under side, both wings are whitish, the primaries being clouded to pale ferru-

ginous on the costal area, and both wings have a faint submarginal line running parallel to the outer margin.

Expanse, 19 mm.

BIZONE, Walk.

46. *B. Africana*, sp. nov. ♂. Pure white. The legs pale yellowish. Posterior wings with one or two black dots on the costa near the base. The primaries are crossed by a median and a limbal transverse line of dark brown, or blackish, somewhat angulated. There are two small black spots on the cell between these lines arranged longitudinally, and one or two black spots on the outer margin below the apex. The female is marked as the male, but larger. Under side of wings immaculate.

Expanse, ♂, 18 mm.; ♀, 20 to 22 mm.

47. *B. Porrima*, sp. nov. ♂. Allied to the preceding species, but smaller, and with the fore wings luteous. The markings very much the same as in the preceding species, but the spots on the cell between the transverse lines coalesce with the lines. Under side of wings white, immaculate. Female like the male.

Expanse of six specimens before me averages 18 mm.

48. *B. rubristriga*, sp. nov. ♂. Snowy-white with two bright crimson transverse bands, with two small black spots enclosed between them on the cell and arranged longitudinally. There are no black spots at the base of the primaries. The crimson bands reappear faintly on the under side.

Expanse, 16 mm. This species is characterized by having the primaries relatively narrower than in the preceding species.

BARSINE, Walk.

49. *B. Gubunica*, sp. nov. ♂. Allied to *B. (Siccia) rivulosa*, Walk., with the type of

which I have compared it, but widely different. The front and collar are pale orange. The thorax, abdomen, and legs are pale reddish-fawn. The anterior wings are pale ferruginous with a double series of irregular spots before the base, a zigzagged transverse median, and a greatly zigzagged transverse limbal band, a spot at the end of the cell, and a submarginal series of spots, all pale purplish. The posterior wings are semi-diaphanous, very pale fuscous. The under side of the wings are without markings, save that the bands in the primaries very faintly reappear. The female is larger than the male and with the spots and bands in the primaries darker, and the ground color of these wings redder.

Expanse, ♂, 20 mm.; ♀, 25 mm.

MILTOCHRISTA, Hübn.

50. *M. numida*, sp. nov. ♂. The front white. The body pale yellowish-fawn. The legs yellowish with the tibiae provided with heavy black tufts before the tarsi. The anterior wings are pale stramineous tinged in some specimens with reddish towards the apex. At the base there are three small black spots. There is a very heavy black spot at the end of the cell. A series of heavy irregular black spots form a transverse median band curved outwardly and coalescing about the middle of the wing with a similar band, which forms with a still heavier submedian band an irregular circle, surrounding the black spot at the end of the cell. There are two submarginal black spots about the middle of the outer margin. In some specimens these coalesce with the heavy submarginal band. The posterior wings have some black spots on the outer margin, heaviest near the outer angle. The markings of the upper surface reappear upon the lower side of the wings, but fainter and poorly defined. The posteriors have a double series of black spots near the outer angle on the outer mar-

gin. The female is marked as the male but with broader wings.

Expanse, ♂, 16 mm.; ♀, 18 mm.

51. *M. Clara*, sp. nov. ♂. Allied to an unnamed species in the British Museum from Sierra Leone. Pale cream color. The posterior wings immaculate. The anterior wings with a small black spot at the base, three similar spots forming a transverse series beyond the base, one of the spots on the costa, another near the middle of the wing, and the third on the inner margin. There is a transverse, zigzagged, pale brown line crossing the wing before the end of the cell; a minute black spot at the end of the cell; another somewhat broader, very irregular, transverse brown line beyond the cell; and a number of small linear black marks upon the outer margin.

Expanse, 16 mm.

52. *M. (?) erythrias*, sp. nov. ♂. Antennae plumose, black. The body dark red. Legs margined with black. Primaries dark red shading into pale orange at the apex, and the outer margin uniformly fringed with dark brown. The primaries have a costal and an interior black basal ray followed by a double transverse line, which is succeeded by a series of irregular, very angulated, and heavy dark markings, which irregularly encircle the black discal dot, which is situated at the end of the cell. These markings are followed by a submarginal series of spots, of which the third and the fifth, reckoning from the costa, and those nearest the outer angle are the largest, the fifth coalescing with the fringe. All of the markings are dark purplish-brown. The secondaries are rosy with the outer margin dark brown. The under sides are marked as the upper, but all the markings are more obscure.

Expanse, 16 mm. I refer this species with great doubt to the genus *Miltochrista*, owing to the heavily pectinated form of the antennae. It represents, possibly, a new genus closely allied to *Miltochrista*.

A MELANISTIC LOCUST.

BY A. P. MORSE, WELLESLEY, MASS.

In the latter part of July, 1892, I had the good fortune to stumble upon a thriving settlement of that elegant locust *Paroxya atlantica* Scudd. in the near vicinity of Cambridge, namely, on the bank of Charles River at Faneuil station. This find was unexpected from the fact that this species is a southern locust and, I believe, has been previously taken in New England only in the southernmost portions. Several weeks later I took one male in a meadow at Newtonville, at quite a distance from the river. These two localities are the only places in which I have met with this species north of Connecticut, where I have taken it at Niantic in a situation similar to that at Faneuil, and at Stamford in the long sedge of bushy pasture meadows, at an elevation considerably above tide-water.

At Faneuil the first specimen taken, a female, was captured while sweeping over some weeds at the edge of the salt-marsh in search of other Acrididae, and search being made, a number of specimens, mostly males, were secured. These were found to be most plentiful on a species of *Spartina*, or cord-grass, along some of the ditches and tidal runways, and while quite active were not difficult to capture, usually trying to escape observation by sidling around the stout grass-stems in preference to flight, which was resorted to only when alarmed.

Among those secured on this occasion was one male which presented a marked contrast to the others in being deep greenish-black in color, with a peculiar oily lustre which became shining on the smoother portions of the body, particularly on the sides of the pronotum, and the thoracic and abdominal sterna. A fuller description is appended.

At a second visit a few days later three more black males were secured, and also two female nymphs as deeply colored as the adult males. No black adult females were taken, though several secured at this time and at a third visit were extremely dark in coloring.

The dark, heavy-bodied females, which seemed to prefer remaining on or near the rubbish of dead stalks and weeds covering the ground, were not noticeable objects; but the more active, black males were quite conspicuous against the green background of the higher zone of growing vegetation which they frequented.

Paroxya atlantica [Scudd. Melanistic male. Description of fresh specimen, taken at Faneuil, Mass., July 22, 1892.

Head, thorax and abdomen deep greenish black. Tegmina translucent, brownish fuscous, with brownish- to greenish-black veins and venules. Wings transparent greenish, the veins and venules dark except in posterior third of anal field, darkest in anterior and axillary fields.

Eyes greenish-black with brownish reflections. Antennae greenish-black, the articulations pale.

Abdomen with the overlapping caudal and pleural margins of each segment paler greenish-black, these paler markings enlarged anteriorly on sterna 6, 7, and 8, to form very obtusely triangular pale spots. A large circular pale spot on sternum 9 reaching the caudal margin. The elevated cephalic margin of sternum 10 pale in median portion.

Fossal membranes deep brown. Femora 1 and 2 deep sage green, lightest on proximal

thirds of caudal faces. Posterior femora black at tips, passing into dark brownish-green on the external face, and olive-green on the internal face and in tibial groove; dusky herring-bone markings on both faces; a dusky spot on the proximal end of the upper groove and another with oblique edges one-third the distance toward tip.

Tibiae deep greenish-black; the posterior shining black at proximal end with a narrow sage-green annulus beyond, widest inside. Spines black. Tarsi deep greenish-black above, paler beneath, especially on the callosities and pulvilli.

A NEW AMERICAN LACINIUS.

BY NATHAN BANKS, SEA CLIFF, N. Y.

Lacinius is a genus of Phalangidae. It was erected in 1876 by Thorell for *P. horridus* Panz. (Sopra alcuni Opilioni d'Europa e dell'Asia occidentale, Ann. mus. civ. st. nat. Genova, vol. viii, 1876). Simon (Arachnides de France tome vii, 1879) united it to Acantholophus Koch, I think, on good grounds. But as Acantholophus is preoccupied, I believe, by MacLeay in Coleoptera, it may be best to use Lacinius; especially so since Simon considers *P. horridus* Panz. as the type of Acantholophus. Lacinius is closely related to certain species of Oligolophus by the spinous eye-tubercle and anterior margin of cephalothorax; also by having prominent spines on the femora of the palpi. It differs in having the eye-tubercle more remote from the anterior margin of the cephalothorax. I believe the American forms can be farther separated from Oligolophus in not having false articulations in the metatarsi. The legs

are shorter than in Oligolophus. Two species of Oligolophus have been described from U. S., *O. pictus* Wood and *O. ohioensis* Weed. The latter I should place in Lacinius; it resembles the European *L. spinosus* Bosc. (*obtusidentatus* Koch); while the species which I describe below has more resemblance to the typical species of the genus *L. horridus* Panz.

Lacinius, Oligolophus, Mitopus and Phalangium form a tribe of the Phalanginae, distinguished by having a prominently spinous eye-tubercle and a group of spines on the anterior margin of the cephalothorax. This tribe may be called Oligolophini. It may be divided into two groups, according to the presence (Lacinius, Oligolophus) or absence (Mitopus, Phalangium) of prominent spines on the femora of the palpi.

Phalangium longipalpis Weed would according to some European

authors be placed in a separate genus, *Cerastoma*; others do not favor the division of the genus on sexual grounds.

Lacinius texanus, nov. sp. Length of body 3.6 mm., width of body 2. mm. Length of femur I, 1. mm., femur II, 3.1 mm., femur IV, 2.1 mm., leg I, 6. mm. Color gray, mottled with white and brown; cephalothorax and dorsum of abdomen gray, mottled with brown and white spots; the vase-shaped mark barely visible; venter grayish white, a black line on the sides. Cephalothorax with some scattered spines and three large ones on the anterior margin, the median the largest; on the sides are three spines projecting between the legs. Eye-tubercle near the hind margin of the cephalothorax, nearly twice its diameter from the anterior margin, with two rows of four large spines. The posterior edge of each dorsal segment of the abdomen provided with a row of about ten white spines. Palpi quite large, white with some brown spots. The femur with about seven large and several smaller white spines on the under side, the end enlarged internally and covered with short, stiff, black hairs. The patella is prolonged, the inner side and prolongation being

covered with short, stiff, black hairs. The tibia is enlarged at the end on the inner side and covered with similar hairs; on the under side are two white spines, like those on the femur. The tarsus (5th joint) is about as long as the two preceding, slightly curved, and provided with stiff hairs and a simple claw at end. Legs pale with brown bands; two on the femur, on the patella, tibia and metatarsus one each, and one at the base of the tarsus. The legs are all short, especially I and III; metatarsus I shorter than tibia I; there are no false articulations in any of the metatarsi. The coxae bear several (3-6) spines, one or two on each coxa being very large; several prominent spines at end of femur, patella and tibia. The femora are round except II which becomes quadrangular near tip; all the tibiae are quadrangular, each angle being furnished with a row of small spines; the patellae are somewhat four-sided, and the small spines are in rows, as also on the femora. The tarsi consist of many short joints. The tips of the claws of the mandibles are black. The structure of the coxae and sternum is similar to that of *Oligolophus*, but the sternum is a little shorter. The lateral pore is not visible from above.

Habitat, Eastern Texas.

THE LARVAL STAGES OF *ICHTHYURA MULTNOMA* DYAR.

BY HARRISON G. DYAR, BOSTON, MASS.

Ichthyura multnoma Dyar.

1892—Dyar, Canadian entomologist, xxiv, 179.

First larval stage.—Head round, shining black with a few hairs; width 0.5 mm. Body somewhat flattened, with long pale and black hairs rising singly from large concolorous tubercles; color sordid grayish, tinged with dark vinous on joints 2, 5, 7, 8, 11 and 12 over the dorsum. Feet normal, the thoracic dark, the abdominal concolorous with the body. As the stage advances, the whitish spaces on the back become nearly white and

the piliferous tubercles come out black and distinct, in three rows on each side. At the end of this, and of each following stage, the larva spins a house of thread and leaves in which it molts, and in which it remains during the succeeding stage, when not eating. The larvae are solitary.

Second stage.—Head as before; width 0.9 mm. Body flattened, with deep segmental incisures; piliferous tubercles large, concolorous at first, but later black; setae short, black. Color blackish vinous except the dorsum of joints 3, 4, 6, 9, 10 and 13 which is greenish

white, containing tubercle i and a very narrow dark dorsal line. The anal plate (*i. e.*, joint 14 or the tenth abdominal segment) is vinous. Lateral and subventral tubercles pale. Thoracic feet black.

Third stage.—Head rounded, median suture deep, shiny black, hairy; width 1.8 mm. Warts rather large, each with a hair, and other somewhat shorter hairs arise from the body. Color vinous black with pale yellow dorsal patches on joints 3 and 4, 6, 9 and 10 and 13 anteriorly, enclosing warts i and ii. A dark dorsal line, each side of which are a few yellow mottlings on the dark segments; subventral warts largely yellow, the others concolorous with the markings except row i which is dark on the yellow segments. Setae all blackish. Later, joints 5 and 12 are seen to be a little enlarged dorsally, a narrow, broken, wavy line appears along warts i in the yellow markings, the yellow patch on joints 9 and 10 extends faintly on joint 11, there is a broken, irregular, yellow, super-stigmatal line, distinct only on the yellow-marked segments and some rather more continuous yellow mottlings along the sub-stigmatal ridge.

Fourth stage.—Head rounded, clypeus depressed, median suture deep; hair short, dense, white; color black, slightly shiny, brownish centrally in the depression around the median suture; width 3.0 mm. Warts rather large, rows i and ii on joints 3, 4, 6, 9, 10 and 13 and all the subventral warts yellow, the others black. Joints 5 and 12 enlarged dorsally, velvety black. Color purplish black, a broad, yellow, dorsal band except on joints 5 and 12, containing a broken, triple, dorsal line, fainter on joints 7, 8 and 11. The rest of the body is purplish black, the subventral region included. Hair dense, white, consisting of fine short hairs from the body, with single, slightly longer and larger ones from the warts. As the stage advances a marked change takes place. A broad pale gray dorsal band, containing very faint triple dark line, obsolescent and broken; warts

i and ii orange, except on joints 2 and 5, row ii on joints 3, 4, 6, 9, 10 and 13 broadly orange; a broad, pale bluish, subdorsal band, heavily mottled with vinous black; joints 5 and 12 dorsally, and lateral spots on all segments (most distinct on joints 3-5), velvety black. A broad, broken, deep orange, stigmatal band, divided by an irregular black stigmatal line and consisting of orange spots spreading from the warts of rows iv and v and adjacent mottlings, barely confluent. Venter blackish; thoracic feet shiny black.

Cocoon.—Not different from the house made at the end of each stage, except that there are a few transverse threads to support the pupa.

Pupa.—Small but robust. Dorsal outline arched, ventral nearly straight, rounded at both ends; cremaster, a long spine of even thickness throughout. Smooth, shining; abdomen very slightly punctured. Color red-brown, darker ventrally and dorsally, nearly black on the thorax and cases, with a green tinge on the latter. Length 13 mm.; width 4.5 mm. There are two broods each year.

Food plant.—Willow (*Salix*).

Habitat.—Oregon and Washington west of the Cascade range and, probably, also western British Columbia. Found by Prof. O. B. Johnson at Seattle, Wash. Larva from Portland, Oregon.

THE MORPHOLOGY AND PHYLOGENY OF INSECTS.

The Annals and magazine of natural history published in December last a translation of the concluding general portion of a memoir by N. Cholodkowsky on the embryonal development of *Phyllostromia germanica* (Mém. acad. St. Pétersb., 7 sér., v. 38, 1891) which closes with the following summary. It will prove interesting and suggestive to American entomologists.

1. The head of insects contains more than four protozonites, probably six, of which one is preoral, but the rest are postoral.

2. The antennae of insects belong to the first postoral segment and are entirely homologous with the remaining ventral extremities. They do not correspond to the antennae of *Peripatus*, but probably to the chelicerae of spiders, and perhaps to the second pair of antennae of Crustacea.

3. Since the possibility that a number of segments in the germinal streak of different arthropods have disappeared is not excluded, a homology of the mouth-parts of the different classes of Arthropoda cannot at present be set up.

4. The abdominal appendages of the insectan germinal streak (including the cerci) are homologous with the thoracic legs. Herein it makes no difference whether these appendages are attached to the middle, at the side, at the front, or hind margin (are meso-, pleuro-, pro-, or opisthostatic, in the terminology of Graber), provided only that their cavity is immediately continuous with that of the somite to which they belong. The fact that the abdominal appendages usually remain unsegmented in nowise tends to show that they are not of the nature of limbs, since, for instance, the mandibles also are always unsegmented.*

5. Many of the abdominal appendages of larvae and perfect insects are homologous with the thoracic legs, even when they are secondary in ontogeny.

6. The primitive function of the first pair of the abdominal appendages was ambulatory, as also that of the remaining appendages. The ancestors of the insects were therefore undoubtedly homopod, not heteropod.

7. The many-legged insect larvae are to be derived from the six-legged just as little as are, conversely, the hexapod larvae from the polypod; both forms developed independently of one another.

8. The embryonic envelopes of the insects probably correspond to the remains of a trochosphere.

* Whether the segmented branchial filaments of *Sisyra* and *Sialis* belong to this category is doubtful, but can only be decided by embryological investigations.

WESTWOOD AND STANTON.

The death on Jan. 2 of Prof. J. O. Westwood of Oxford at the advanced age of 87 removes the most distinguished entomologist of our time. For sixty-five years his contributions to our science have been uninterrupted and have enriched and advanced every branch of systematic entomology. No writer has made known so many singular forms, for which he seems to have had a remarkable predeliction. He had a *Laërtian* eye for structure and he depicted insects with rare skill; of his published drawings there must be many thousands, and they are of the utmost service to the systematist; yet his portfolios are crowded with unpublished figures. His Introduction to the classification of insects, though half a century old, is a storehouse of fact and historical statement, admirably presented and still our best general guide; but to do for the entomology of today what he did for that of 1840 would require treble the space he gave to it. No entomologist the world over has been held in such reverent esteem by Americans as Westwood.

News comes from England of the death of Mr. H. T. Stainton at the age of 70. His studies of the Tineina are well known to all American entomologists and he will be remembered especially by them for his careful collocation of the scattered papers of our own Brackenridge Clemens on the subject. Stainton did much to interest the young in entomology and edited journals especially intended for the tyro and collector. His work on the Tineina was curiously published in four different languages in parallel columns. Most of us are glad to publish in one.

ENTOMOLOGICAL NOTES. — The first volume of Moore's gigantic undertaking upon the Lepidoptera Indica is now completed with the publication of Part 12. This fine quarto volume, dedicated to the Empress of India and begun in 1890, contains 340 pages and 94 colored plates and yet deals with only two subfamilies of Nymphalidae — the *Euploecinae* and *Satyrinae*.

Early in 1891 Osten Sacken proposed a new

grouping of the Diptera orthorrhapha, which he has now published in detail in English in the Berliner entom. zeitschr. for 1892 (pp. 417-466). His *Nemocera vera* contain the families Cecidomyiidae, Mycetophilidae, Culiidae, Chironomidae, Psychodidae, Dixidae (?), and Tipulidae; his *Nemocera anomala*, the Bibionidae, Simuliidae, Blepherozeridae, Rhyphidae and Orphnephilidae; and his *Eremochaeta*, the Stratiomyidae, Tabanidae, Acanthomeridae and Leptidae (+Xylophagidae). His complete discussion will be found very interesting.

With the publication of the seventh part Distant has completed his Monograph of Oriental Cicadidae, a large quarto of over 150 pages and 15 plates crowded with admirable figures. The work includes 268 species arranged in 34 genera and divided into the two subfamilies of Cicadinae and Tibiceninae according as the tympana are mostly covered or uncovered. Owners of the work, which is published by the Indian Museum of Calcutta, will be glad to place it by the author's Rhopalocera Malayana.

The recent publication of a new part of the Proceedings of the Entomological society of Washington completing vol. 2 and filled with biological papers of broad interest, emphasizes once more the concentration of entomological industry at our national capital and the excellent influence exerted by the division of entomology in the U. S. department of agriculture.

PROCEEDINGS OF SOCIETIES.

CAMBRIDGE ENTOMOLOGICAL CLUB.

9 December, 1892. The 174th meeting was held at 156 Brattle St. Mr. S. H. Scudder was chosen chairman.

Mr. Howard Evarts Weed of Agricultural College, Miss., was elected an active member.

Mr. S. H. Scudder exhibited a sketch of the body of a carboniferous walking stick, *Protophasma*, from Europe to show that the three divisions of the thorax must have been of nearly equal length and not as in living

Phasmidæ very unequal, the prothorax in living forms (with the exception of *Protophasma*, *Phyllium* and similar highly specialized forms) being much shorter than the other two divisions. He stated that this was the condition now of the embryo *Diapheromera* just before leaving the egg, the elongation of the mesothorax and metathorax taking place during the emergence of the insect from the egg. This adds another to the numerous instances in which the early types of animals resembled the embryonic rather than the mature condition of their modern representatives.

He also stated that in the examination of a nearly ripe embryo of *Dissosteira carolina*, he found one of the antennae completely developed, which the other showed only the enlarged base, the stalk being entirely absent. In the same embryo there was an entirely different arrangement of the middle legs of the two sides; on one side, which seemed the normal, the femur overlay the hind femur and the tibia and tarsi were folded sharply back upon the femur; upon the other, the femur lay beside the hind femur, and the tibia was bent at only about a right angle to the femur; but apically was with the tarsi twice bent to keep it from extending beyond the opposite side of the body.

He remarked further on a species of *Grylodes* found in a burrow beneath a small sand hillock in Florida, by Mr. C. J. Maynard.

Mr. A. P. Morse showed some specimens taken by him at Wellesley, Mass., Nov. 17, 1892, of the following species: *Chortophaga viridifasciata*, *Stenobothrus curtipennis*, *Melanoplus collinus*, *Encoptolophus sordidus* and *Eurymus philodice*. All the specimens were mature. In the case of the first named an unusual occurrence at that season of the year.

He also showed a specimen of *Xabea bipunctata* taken by him at New Haven, Conn., Aug. 30. Mr. Scudder said he thought it had not been previously taken in New England.

PSYCHE,

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PSYCHE.

NOTES ON TACHINIDAE.

BY S. WENDELL WILLISTON, LAWRENCE, KANS.

Some years ago, I described (Trans. Amer. ent. soc. xiii, p. 305) a peculiar genus of Tachinidae, under the name *Melanophrys*. Very recently, I have had the opportunity of examining specimens of an allied species, the types of *Atropharista jurinoides* Towns., now in the collection of Mr. Aldrich. A rather peculiar combination of characters which these specimens present will render the following notes of interest.

In the male of *M. flavipennis* Will., the eyes are conspicuously pilose. In the male of *M. jurinoides* Towns. the pilosity is inconspicuous; still hairs can be seen upon close examination. In the females of both species, the eyes are bare even under a searching examination. Hairiness of the eyes is usually considered a generic character in this family; here it is distinctly sexual. The antennae in the male of *M. flavipennis* have the second joint not more than one-fourth of the length of the third; in a female taken with the male, the second joint is about three-fourths the length of the third,—it possibly represents a distinct species. In both sexes of *M. jurinoides*, the third joint is only a little longer than the second.

In the male of the former species, there is a considerable pilosity on the thorax and abdomen, wanting in all the other specimens, both male and female. *M. flavipennis* otherwise differs from *M. jurinoides* in the presence of a pair of median bristles on the hind margin of the second abdominal segment. In *M. flavipennis*, the color-markings of the front of the male are like those of the females of both species; in *M. jurinoides* they are conspicuously different.

The singular thing about the species is that the females are so remarkably alike that one is only assured that they belong to different species by the pair of bristles on the second abdominal segment. This is all the more strange from the fact that the color-markings, as also the structure of the head, are conspicuously unlike those of allied genera. I should have mentioned the fact that I have a female of *M. flavipennis*, agreeing more nearly with the male in its antennal structure.

Professor Townsend has recently published a useful table of the North American genera of Tachinidae (Trans. Amer. ent. soc. xix, p. 92, June, '92). Unfortunately its value

is much impaired by a previous paper of Brauer and Bergenstamm, published in 1891, and received the latter part of that year, in which some thirty or more additional, old or new genera are referred to North America, and which must conflict more or less with Mr. Townsend's genera.

I cannot join with Mr. Townsend in his sweeping condemnation of Brauer and Bergenstamm's work in this family. The descriptions of these authors are often involved and obscure, but I believe that patient study, together with ample

material, will, almost always, solve the problems which they contain. Especially do I think so from the fact that these authors have given excellent figures of most of the genera (three hundred and over) known to them, and figures are usually more valuable in this family than extended descriptions. I by no means wish to affirm my faith in the validity of many of the characters used by them, but a correct interpretation of the value of these characters will be of more service than a multiplication of genera.

PROCEEDINGS OF SOCIETIES.

CAMBRIDGE ENTOMOLOGICAL CLUB.

13 January, 1893. The 175th regular and 17th annual meeting (since incorporation) was held at 156 Brattle St. Mr. S. H. Scudder was chosen chairman.

The annual reports of the Secretary, Treasurer and Librarian were presented.

The following officers for 1893 were elected: President, W. H. Ashmead of Washington; Secretary, R. Hayward; Treasurer, S. Henshaw; Librarian, S. H. Scudder; members at large of the Executive Committee, A. P. Morse and S. H. Scudder.

The annual address of the retiring President, Dr. W. J. Holland, on "Communal cocoons and the moths that weave them" was next read by Mr. Scudder in the absence of the President. In this address Dr. Holland erected the genus *Oecura* and described the following new species: *Oecura goodii*, *Anaphe clara* and *A. subsordida*.

Mr. S. H. Scudder called attention to a somewhat similar habit in one of the Mexican Pieridae (*Eucheira socialis*) described by Westwood.

Mr. H. G. Dyar said that some individuals

of *Clisiocampa* usually remain in the nest and undergo their transformations.

Mr. A. P. Morse, with reference to *Clisiocampa*, stated that he had seen a Baltimore oriole (*Icterus baltimore*) open a nest, but that it had considerable difficulty in opening the cocoons contained therein.

Further discussion followed in which all participated.

Mr. A. P. Morse read a short paper recording the occurrence of *Paroxya atlantica* at Faneuil Station, Mass., last summer and stated that he had captured there melanistic specimens.

FOREIGN NOTES.—Mr. Charles Brongniart has succeeded Mr. H. Lucas as assistant at the Paris museum in charge of the arthropods.

We regret to record the death of the veteran German lepidopterist, Dr. Adolph Speyer of Rhoden, the precision of whose work in the study of structure and of geographical distribution has had a good influence in science.

The eleventh part of Kolbe's Introduction to entomology continues the internal anatomy, dealing with respiration, heat, the fatty bodies and luminosity, and begins upon the digestive apparatus.

(Continued from page 400.)

53. *M. Craigii*, sp. nov. ♂. Antennae, front, and upper side of thorax pale luteous. The upper and lower sides of abdomen luteous inclining to ferruginous. There is a black spot on the top of the head, a black spot in the centre of each of the patagia, and a black spot or two in the middle of the upper part of the thorax. (The pinned specimens before me do not enable me to give the exact number of spots upon the thorax). The under side of the abdomen is marked with a double row of brown spots, and the legs, which are of the same color as the under side of the abdomen, are heavily margined with black. The tarsi are black banded with yellow. The prevalent color of the wings is pale luteous. The primaries have a dark brown ray upon the costa at the base and an interior basal ray of the same color. Beyond these are three small brown spots succeeded by a very irregular transverse median band which is divided into two parts on the costa. There is a black dot at the end of the cell, and a transverse limbal band exceedingly irregular and sharply angulated ten or twelve times. Beyond this, there is a submarginal series of black spots, of which the first, the third, the fifth, and the sixth, reckoning from the costa, are the largest. The fringe is dark brown on the primaries. The secondaries have a number of dark marks near the outer angle. The markings of the upper side reappear upon the lower side, but are fainter than on the upper side on the primaries, and darker than on the upper side on the secondaries. The female is like the male, but larger, and the markings more distinct.

Expanse, ♂, 14 mm.; ♀, 18 mm. Habitat, Benita. (January 31st, '91.)

LEPISTA, Wallengr.

54. *L. xanthopa*, sp. nov. ♂. Antennae, front, lower side of thorax, and legs testaceous. The collar, and upper side of the

thorax, and upper and lower sides of the abdomen are orange-luteous. The primaries on the upper side are orange-luteous with the outer border pale plumbeous. The secondaries are very pale luteous with the outer margin very narrowly edged with plumbeous from the outer angle half way to the inner angle. On the under side, the primaries are plumbeous with the costal and inner margins luteous. The secondaries on the under side are as on the upper side.

Expanse, 25 mm. This species is most closely allied to *L. limbata*, Butl., with the type of which I compared it, but from which it is widely different.

55. *L. monochroma*, sp. nov. ♂. Front orange-luteous. Body and wings throughout pale fawn without any markings. The under side at the costa of the primaries slightly tinged with orange. Expanse, 24 mm.

56. *L. subumbrata*, sp. nov. ♂. Antennae and front whitish. Eyes black. The upper side of the thorax and abdomen fawn color. The lower side of thorax and legs the same. Under side of abdomen whitish. The upper side of the primaries pale plumbeous with the costal margin narrowly edged with white. The secondaries pale luteous broadly margined on the costa and at the outer angle with plumbeous. The fringes of both wings plumbeous. The lower side is marked exactly as the upper. Female like the male but larger. Expanse, ♂ 25 mm.; ♀ 30 mm.

SOZUZA, Wallengr.

57. *S. decipiens*, sp. nov. ♂. Antennae, head, and thorax rufous-ochraceous. The abdomen and lower side of thorax paler. The primaries rufous-ochraceous with a dark brown spot on the middle of the costa, and another smaller spot below the cell near the middle of the wing. Secondaries paler than the primaries. Under side of wings immaculate with the costa of the primaries slightly

tinged with rufous, and the apex shading into dark brown. Female like the male but larger. Expanse, ♂ 24 mm.; ♀ 30 mm. This species is in the British Museum unnamed.

NUDARIA, Haw.

58. *N. juvenis*, sp. nov. ♂. Antennae, front and head gray. Thorax and abdomen above and below dark gray. Primaries dark fawn with some black marks on the costa near the base, and four black marks upon the costa beyond the base. There is a very minute black dot within the cell and a large oblong black dot at the end of the cell. A transverse angulated line crosses the wing from the first of the costal marks beyond the base and a pale irregularly curved and strongly angulated submarginal line beyond the black dot at the end of the cell. The outer border is clouded with a number of dark marks heaviest near the outer angle. The margin has a narrow black linear dot on each of the interspaces and the fringe is concolorous. The secondaries are paler than the primaries. The under sides of both wings are immaculate, save that there is a faint and diffused discal dot on each of them. Expanse, 18 mm.

59. *N. lacteata*, sp. nov. ♂. Body and legs yellowish-white. Primaries and secondaries white, the latter immaculate, the former with a few pale fawn color marks near the base, and a curved transverse median and a transverse submarginal band of the same color. Expanse, 15 mm.

HEMONIA, Walk.

60. *H. luteicincta*, sp. nov. ♂. Body and legs whitish. Primaries pale fawn with the costa and the outer margin bright yellow. About the middle of the costa there is a pale whitish subtriangular mark bounded externally by a dark line, which crosses the wing obliquely to the outer angle. The secondaries

are whitish, immaculate. The under side is as the upper, but paler, and all the markings indistinct. Expanse, 15 mm.

EUGOA, Walk.

61. *E. costiplaga*, sp. nov. ♂. Body testaceous. Primaries wood-brown, darkest on the basal half. Upon the middle of the primaries upon the costa there is a subtriangular white spot. There is a faint curved submedian line and an obscure poorly defined discal dot. The secondaries are testaceous. The under side uniformly pale testaceous, shining. Expanse, 15 mm.

62. *E. tropicalis*, sp. nov. ♂. Upper side of body dark gray. Lower side whitish. The legs dark gray. The primaries pale wood-gray, clouded near the base with blackish, beyond which there is a very faint and curved transverse line succeeded by a dark transverse limbal shade covering the end of the cell and extending beyond it. In the middle of this dark band is a large discal dot, whitish in color, pupilled with blackish. Beyond this shade, there is a faint curved limbal line, blackish in color margined internally with pale gray. There is a strongly angulated submarginal line, the angulations in which are most sharply produced beyond the end of the cell and near the outer angle. Margin narrowly blackish. Fringes dark gray. The secondaries are whitish, shading into testaceous upon the outer margin. The fringes are whitish. The under side of both wings is immaculate, pale testaceous, shading into whitish upon the inner margin of the secondaries. The fringes are as upon the upper side, dark gray upon the primaries, and whitish upon the secondaries. Expanse, 20 mm.

NYCTEMERIDAE.

TERINA, Walk.

63. *T. tenuifascia*, sp. nov. ♂. Antennae black. Front white. Head black. Collar and upper side of thorax orange-red. Upper

side of abdomen brown with a dorsal line of white spots. Under side of thorax orange, of abdomen gray, annulated with whitish. Legs dark gray, margined with whitish. Primaries dark orange-red with the apical third black, and a large white subapical spot. The secondaries are margined with black, the band incised deeply opposite the cell. The under side of the wings is as the upper side but somewhat paler. Expanse, 33 mm.

The marginal band on secondaries is narrower than in any other species thus far described.

64. *T. minor*, sp. nov. ♂. Antennae orange with the pectinations black. Front, head, thorax, and upper side of abdomen uniformly dark orange-red. The under side of the body, the collar, and the legs whitish. The upper side of the wings is uniformly dark orange-red, the outer half of the primaries deep black, and the outer third of the secondaries bordered with the same color, the border diminishing from the outer angle to the anal angle. The secondaries have a conspicuous black discal dot at the end of the cell. On the under side the inner margin of the primaries is pale yellow, while the costal area is of the same color as on the upper side; but the outer area, which is black above is chocolate-red beneath, shading into black before the inner area. The secondaries are ferruginous, shading into orange upon the inner margin. The black outer band of the upper side is replaced upon the lower side by chocolate-red. The black discal dot is as on the upper side. Expanse, 28 mm. Habitat, Benita.

OTROEDA, Walk.

65. *O. permagnifica*, sp. nov. ♂. Antennae testaceous. Front white. Palpi black margined with white below. Collar black with a large white spot on the middle and a smaller one on either side at the base of the wings. Tegulae black margined with white.

There are two white spots on the hind part of the thorax. The upper side of the abdomen is orange-red with a heavy black dorsal line and similar lines on either side. The under side of the thorax is orange-red. The legs are whitish margined outwardly with black. The tarsi are black ringed with white and the anterior legs have a small oval white spot in the middle of the black margin of the tibiae. The under side of the abdomen is white with a ventral row of cuneiform black spots. The primaries are bright orange-red, inclining to fulvous near the costa. At the base, there is an irregular black spot. The costa at the base is narrowly edged with black, then more broadly edged with the same color, then again more narrowly edged, and just before the end of the cell, this border rapidly widens out into the broad apical black area, covering the outer half of the wing. The inner margin of this black area extends in an irregularly curved line around to a point upon the inner margin one fourth of the distance from the outer angle to the base. This black apical tract is interrupted by a marginal band of large white spots increasing in size toward the costa and preceded inwardly by a series of large white spots running from the costa outwardly and terminating above the fifth spot from the inner angle. On either side of the ends of the nervules there is a narrow white line produced inwardly, recalling the marking which is found upon the margin of the wing of *Diadema dinarcha*, Hew. The secondaries are broadly orange-red with a heavy black border interrupted by a band of large submarginal white spots and a marginal series of white markings similar to those upon the primaries. The under side is marked as the upper side. Expanse, 90 mm.

This exceedingly beautiful species differs very largely from any other species in the genus in the style of its markings. It may be worthy of note that in the large series of specimens of *Otroeda* numbering nearly sixty in my possession, I find many intergrading

forms, which lead me to the conclusion that *O. hesperia*, Cram., *O. occidentis*, Walk., *O. cafra*, Dru., and probably *O. Jonesi*, Sharpe, are forms of one variable species.

LIPARIDAE.

EUPROCTIDION, gen. nov.

Antennae of the male strongly pectinated. Palpi porrect. First and second joints densely covered with short hair. The second joint swollen. The third joint very minute, naked at the extremity. The abdomen is one quarter longer than the secondaries, tufted at the anal extremity, and with two tufts of hair upon the dorsal line behind the thorax. The primaries have the costa moderately convex, the outer margin strongly convex, the outer angle produced as in the genus *Calpe*, and the inner margin convex before the base. The secondaries are subovoid. The neurulation is characteristic of liparid genera, the radial in both wings originating at the same point as the last median nervule. The discocellular nervelets form a sharp angle at the middle of the end of the cell.

66. *E. Gabunica*, sp. nov. ♂. Antennae with the culmen whitish, the setae dark brown. The palpi, the head, and the upper side of the thorax are dark brown. The abdomen is pale testaceous with the apex tufted with black and two small tufts of brown hair upon the dorsal line back of the thorax. The lower side of the abdomen is yellowish. There is a lateral brown line separating the dorsal area from the ventral area of the abdomen on either side. The primaries have the outer angle produced inwardly and the inner margin slightly convex before the base. The outer margin is regularly convex. The primaries are wood-brown, clouded in the middle with dark brown, and with a curved whitish band crossing the middle of the wing from the costa about the middle to the inner margin one third of the distance from the base. This band is enlarged outwardly be-

yond the cell, where it has on its outer edge a light line defined inwardly with brown and terminating at the origin of the third median in a bright white spot. The limbal area has some whitish marks near the costa and near the inner margin. The outer margin is defined by a series of black dots. The fringes are reddish. The secondaries are creamy-white. The fringes are concolorous. On the under side both wings are creamy-white with the costal area heavily clouded with dark brown. Expanse, 24 mm.

LIPARIDAE.

EUPROCTIS, Hübn.

67. *E. Reutlingeri*, sp. nov. ♂. Palpi dark brown. Front reddish. Antennae and upper side of thorax gray. Abdomen gray. Legs concolorous, with the inner margin of the first pair marked with dark brown. Primaries pale wood-brown, crossed in the middle by a broad dark brown band angulated beyond the end of the cell, and with some obscure brown subapical markings. The secondaries pale wood-brown with the fringes lighter. The under side pale grayish-brown with the basal area of the primaries darker and the costa of the primaries narrowly edged with black near the base. The secondaries have a regularly curved submarginal pale brown line. Expanse, 17 mm. Habitat, Benita.

HETERONYGMIA, gen. nov.

Antennae short, heavily pectinated in the male, moderately pectinated in the female. The abdomen very little longer than the secondaries, tufted. Palpi porrect, appressed, the second joint very long and heavily clothed with hair; the third joint minute and almost entirely concealed by the hairy vestiture of the second joint. The primaries are subtriangular with the costa in the male straight, or very slightly convex for two-thirds of the distance from the base, then curving rapidly at the apex. The apex in

the male is truncate, in the female slightly rounded. The secondaries are subovate with the outer margin evenly rounded and the inner angle subacute.

68. *H. stigmatica*, sp. nov. ♂. Antennae, palpi, front, head, thorax, and abdomen above pale ochre-yellow. There is a dark brown shade running across the head and thorax on the dorsal line. The under side of the body is paler. The legs are concolorous, with the anterior pair marked with brown upon the tarsi. The primaries are ochre-yellow with the outer and inner margins narrowly dark brown. There is a large poorly defined subquadrate brown spot at the end of the cell. Before this toward the base is a geminate curved transverse line, the outer member of which fuses on its margin with the brown spot. There is a similar irregularly curved geminate transverse limbal line and a submarginal line, the upper portion of which is formed by three black subapical dots, and which near the outer angle is accentuated by two similar black dots. There is also a brown dot near the costa at the base, and another below the cell near the origin of the first median nervule. The secondaries are pale cream-buff with the fringes pale brown. The under side of the wings is pale cream-buff, with a large black discal dot at the end of the cell. A narrow transverse limbal line runs from the costa of the primaries parallel to the outer border as far as the second median nervule followed by one or two subapical black dots. The secondaries have a similar line running from the costa before the outer angle and succeeded by a black dot below this angle. There are two similar dots near the anal angle. The fringes of the primaries are dark brown checked with paler brown at the extremities of the nervules.

♀. The female is larger than the male and with the markings more distinct. The primaries have a heavy rufous shade near the middle of the outer margin extending inwardly in some specimens as far as the cell. Expanse, ♂, 30 mm.; ♀, 38 mm.

69. *H. clathrata*, sp. nov. ♂. Antennae with the culmen pale gray, pectinations testaceous. Palpi brown. Front, head, thorax, and abdomen above and below vinaceous. The legs darker. The abdomen on the under side paler. The primaries are vinaceous with the costa darker. They are crossed at the middle of the cell and upon the middle of the limbal area by straight whitish lines running at right angles to the inner margin and shaded broadly internally by brownish and narrowly externally by the same color. The outer margin is darker. The secondaries are very pale vinaceous with the fringes slightly darker. The under side of the wings is uniformly very pale pinkish-vinaceous irrorated near the costa with a few brownish scales, and with the fringes of the primaries brown. Expanse, 33 mm.

70. *H. basibrunnea*, sp. nov. ♂. Antennae testaceous with the culmen lighter. Palpi and front whitish. Thorax fawn color. Upper side of abdomen pale fawn. Lower side of the thorax and abdomen paler. Legs concolorous with tarsi ringed with black. The primaries are reddish-ochraceous from the base to beyond the cell with the costa and limbal half and inner margin fawn. At the end of the cell, there is a large brown spot defined outwardly by two silvery white spots. The wing is further marked by an irregularly curved transverse limbal line accentuated with black dots beyond the cell. The fringes are fawn checked with dark brown. The secondaries are uniformly pale slaty-gray. The under side of both wings is pale gray slightly tinged near the outer margin with yellowish and with an incomplete narrow brown subapical line in both wings and the costal areas sparingly sprinkled with brownish scales. Expanse, 37 mm.

71. *H. argiloides*, sp. nov. ♂. Antennae pale testaceous. The upper side of the thorax is very pale cream-buff. The upper side of the abdomen pale fawn. The lower side of the body creamy-white with the legs concolorous, the anterior pair margined in-

ternally with dark brown. The primaries are pale cream-buff with the basal third and the outer margin heavily sprinkled with blackish scales. The immaculate median area is defined inwardly by an irregularly angulated and curved narrow black line and outwardly by a still narrower line. At the apex, opposite the end of the cell, and on the median interspaces, the outer margin is marked by a double series of black spots. The secondaries are white with the outer margin near the anal angle shaded with pale gray. The under side of the wings is uniformly creamy-white. Expanse, 30 mm.

72. *H. arctioides*, sp. nov. ♂. Antennae testaceous. Culmen lighter. Palpi pale reddish-brown. Front, collar, and thorax pale ochraceous with a dark brown median line upon the thorax. The upper side of the abdomen is creamy-white shading into grayish at the extremity. The under side of the body lighter in color. The legs are concolorous with the tarsi ringed with pale light brown. The primaries are very pale ochraceous and on the cell near the base shading into whitish. They are profusely marked with an exceedingly intricate series of reddish-brown lines, of which those beyond the base and on the middle of the wing are the heaviest, the latter forming an ill-defined transverse median band. There is a dark brown shade on the outer margin below the apex and at the outer angle. The secondaries are uniformly creamy-white. The under side of the wings is creamy-white with a few obscure brownish markings near the apex of the primaries and along the costal margin of the secondaries. The fringe of the primaries on the under side is pale brown. Expanse, 30 mm.

73. *H. rhodapicata*, sp. nov. ♂. Antennae testaceous. Front whitish. Upper side of thorax dark ecru-drab. Abdomen yellowish with a dorsal line of blackish spots most

conspicuous at the extremity. The under side of the body is yellowish, the legs are of the same color, with the joints and the tarsi marked with black. The primaries are drab, with obscure basal, median, and submarginal transverse cloudings of darker drab. The secondaries are white. The under side of the wings is creamy-white, tinged on the costa of the primaries with yellowish, and with the apex and outer margin of the primaries very broadly, and of the secondaries very narrowly flushed with rosy pink. Expanse, 40 mm.

This species has the wings relatively broader than in the other species of the genus.

74. *H. hypoxantha*, sp. nov. ♀. Antennae blackish. Front dark brown. Palpi black, reddish beneath. Thorax dark brown above. Abdomen ochre-yellow with a dorsal line of small brown spots. The under side of the thorax is yellow. The first two pairs of legs are black margined with yellowish. The last pair yellowish. The primaries are prevalently brownish-drab. On the inner margin near the base are some black markings. Before the base, there is a curved transverse brown line succeeded by a black dot in the middle of the cell. The end of the cell and the costa above are paler than the body of the wing, and at the extreme end of the cell, there is a large curved discal mark composed of two black lines enclosing a lighter space between them. Beyond the cell, there is an angulated pale brown line defined inwardly and outwardly by double dark lines and succeeded by a subapical shade upon the costa and by a curved shade of light color near the inner angle. There is a narrow, very irregular and broken submarginal series of black lines and spots. The secondaries are uniformly dark ochre-yellow. The under side of both wings is dark ochre-yellow, with the outer third of the primaries testaceous. The black dot and the black discocellular mark of the upper surface reappear upon the primaries and are more sharply defined. Expanse, 43 mm.

LOMADONTA, gen. nov.

Allied to the preceding genus, from which it differs principally in the form of the primaries, which have the apex acute, the outer margin straight but sharply produced at the extremity of the third median nervule.

75. *L. erythrina*, sp. nov. ♂. Palpi white. Front and upper side of thorax pale reddish-fawn. Abdomen pale reddish with a dorsal line of darker markings. The under side of the thorax and abdomen with the legs are whitish. The primaries are pale yellow, with the costa and a broad subapical transverse band, running from the costa to the outer margin at its toothed projection, fawn color, defined outwardly and inwardly by darker lines. Below this band between the first and second median nervules, there is a large oval silvery spot defined inwardly by dark brown, and the remaining portions of the wing are traversed by parallel undulating red lines. The secondaries are white, shading upon the costa and outer margin into yellowish, with the fringe near the anal angle brown. The under side of both wings is white. The apex of the primaries is tipped with yellow, preceded by the broad band of the upper side, which reappears on this side more obscurely. Both primaries and secondaries have an obscure discocellular dot.

♀. Marked like the male but with the broad subapical band on the primaries obsolete. The dorsal line of dark spots is most conspicuous in this sex. Expanse, ♂, 33 mm.; ♀, 36 mm.

ARTAXA, Walk.

76. *A. nigra*, sp. nov. ♂. Antennae pale fawn. Palpi, front, and upper side of thorax of the same color. The upper side of the abdomen near the thorax is fawn color shading into dark brown near the extremity. The under side of the body and the legs are pale fawn. The primaries and secondaries are uniformly smoky-brown, or blackish,

with the fringes slightly paler, and a few fawn colored hairs at the base of the wings. On the primaries, there are two or three coal-black subapical spots. On the under side, the wings are lighter than on the upper side, with the bases and the margins pale fawn. Expanse, 32 mm.

This well marked species is represented by specimens taken at Lake Onanga.

77. *A. mesomelaena*, sp. nov. ♂. Front ochraceous. Antennae whitish with darker pectinations. Body dark brown above, whitish below. Legs concolorous. The wings on the upper side are pale cream-buff. The primaries are traversed on the middle by a broad black band, divided into spots by the neurations, which are whitish. There is a submarginal line of faint light brown markings common to both wings. The under side of both wings is pale cream-buff with the basal area of the primaries shaded with pale brown, and a submarginal line of the same color on both wings. Expanse, 15 mm.

78. *A. tessellata*, sp. nov. ♀. Palpi, front, and thorax rufous. Abdomen brownish with a dorsal row of upright tufts of blackish hairs. There are six of these tufts about one millimetre in height. The under side of the body and the legs are pale yellowish. The primaries are ochraceous with the middle area clouded with black, and with a limbal band running from before the costa parallel to the outer margin to the middle of the inner margin. These black bands are broken on all the nerves which they cross, the nerves being of the prevalent ochraceous ground-color. The secondaries are uniformly sooty-brown with the fringes pale ochraceous. There is a black discal dot at the end of the cell of the secondaries. On the under side, the primaries are sooty-brown with the costa and the margins pale buff. The secondaries are pale buff with a large discal dot and a curved median brown line and a few obscure submarginal shadings. Expanse, 25 mm.

79. *A. palla*, sp. nov. ♂. Front white. Thorax pale ochraceous. Abdomen grayish. Under side of body and legs whitish. Primaries above yellowish-white traversed by a median curved band of blackish scales, the band being whitish near the end of the cell. The secondaries are uniformly creamy-white. The under side of both wings is pure white with a brownish ray at the base of the costa of the primaries. Expanse, 22 mm.

80. *A. melaleuca*, sp. nov. ♂. Head and thorax yellowish. Antennae of the same color. Abdomen whitish above. The lower side of the body with the legs is whitish. The primaries are yellowish-white with a basal and broad median and a submedian band of dark fuscous interrupted on all the neurations by the ground-color. The secondaries are uniformly whitish. The under side of both wings is shining whitish with the inner half of the primaries very slightly shaded with darker gray. Expanse, 15 mm.

81. *A. xanthomelaena*, sp. nov. ♂. Head, thorax, and abdomen ochraceous, paler below. Legs concolorous. The primaries are bright orange, with a basal, median, and angulated transverse limbal band of brown, none of which reach the costa, and all interrupted upon the neurations by lines of the lighter ground-color. The apex and the outer margin are uniformly orange. The secondaries are uniformly pale buff. On the under side, both wings are uniformly pale buff. Expanse, 20 mm.

82. *A. parallela*, sp. nov. ♂. The upper side of the head, the abdomen, and the antennae are yellowish. The palpi are brown. The lower side of the body and the legs are whitish. The primaries are uniformly pale yellow with a median band of blackish scales running from near the end of the cell to the inner margin and bounded outwardly by parallel lines. The secondaries are creamy-

white. Both wings on the under side are uniformly pale creamy-white, shining. Expanse, 22 mm.

83. *A. discipuncta*, sp. nov. ♂. Head, thorax, and abdomen white above and below. Legs white. The primaries are white with a few obscure yellowish marks beyond the cell and on the costa, and near the inner margin. There is a large round black dot at the end of the cell, some blackish scales on the inner margin near its middle, and a series of black scales and dots on the outer margin near the apex and at the inner angle. The secondaries are uniformly white. The lower side of both wings is uniformly white with the costae near the base very faintly tinged with luteous. Expanse, 24 mm.

84. *A. rotunda*, sp. nov. ♂. Primaries and secondaries relatively broader and more rounded on the outer margin than in any of the other species described in this paper. Body and wings white above and below. The primaries have three subapical black marks on the upper side, of which the lower one is the most distinct, and in some specimens there are a few blackish scales on the inner margin of the upper side of the primaries. Expanse, 23 mm.

85. *A. apicipuncta*, sp. nov. ♂. Body and appendages whitish. The primaries, which are relatively longer than in other species described in this paper, are white traversed about the middle by a curved band of pale ochraceous, which near the inner margin is sprinkled with blackish scales. In some specimens, the base of the primaries is also slightly tinged with pale ochraceous. At the apex of the primaries there are three or four bold black markings, of which the second and the fourth, reckoning from the costa, are the smallest. The third is uniformly the largest. The secondaries are uniformly white, as is also the under side of both wings.

ORGYIA BADIA, HY. EDW. AND OTHER NOTES, WITH A TABLE TO SEPARATE THE LARVAE OF ORGYIA.

BY HARRISON G. DYAR, BOSTON, MASS.

ORGYIA BADIA Hy. Edwards.

1873, Hy. Edw., Proc. Cal. acad. sci., v, 188.

1881, Hy. Edw., Papilio, i, 62. = *antiqua*.

1883, Hy. Edw., Papilio, iii, 189. = *antiqua*.

1887, Hy. Edw., Ent. amer., iii, 147, *sp. dist?*

1891, Smith, List lep., p. 27. = *antiqua*.

Does *Orgyia badia* occur elsewhere than on the Island of Vancouver, B. C.? The larvae found there by myself were quite constant, and correspond exactly with Hy. Edwards' original description. They differ structurally from the larvae of *O. antiqua* which were found right across the water at Port Townsend, Wash., and in various places in New England and northern New York. But *O. badia* ♀♀ when brought to New York and exposed there, attracted ♂♂ of *O. antiqua* and hybridized with them. It would seem as if *O. badia* was an isolated local race cut off from communication with the parent species by the water surrounding Vancouver Island. If this view is correct, the name should stand for the race. I append brief descriptions of all the early stages of both *O. badia* and *O. antiqua* for comparison.

ORGYIA ANTIQUA RACE BADIA Hy. Edw.

Egg. — Spherical, a little elongate and flattened on top; smooth, white, with a pale brown spot and ring on top; diameter 1 mm. Laid closely over the outside of the cocoon of the ♀ moth without any covering whatever.* The eggs hatch the next spring.

First stage. — Head rounded, shiny black; width 0.55 mm. Body blackish, except the

dorsum of joints 3-4, 9-13, where it is largely whitish, especially on the anterior patch. Cervical shield black. The subdorsal warts on joint 2 are large, all the warts black; hairs black, several from each wart. There are no hair pencils, brush tufts nor retractile tubercles. At the end of the stage a reddish spot appears centrally on joints 9 and 10.

Second stage. — As before, except that the two retractile tubercles on joints 10 and 11 have appeared. They are orange red, as are also the bases of the large hair bearing warts on joint 2. There is a whitish lateral line and the white patches on joints 9 and 13 are orange tinted. Width of head 0.75 mm.

Third stage. — Body black, abdominal feet and venter pale. The dorsal patch on joints 3 and 4 is divided by a black line, and the lateral area is grayish. Subdorsally on joint 2 is a pair, and dorsally on joint 12 a single short, square, black pencil of plumed hairs. On joints 5-8 are four bush-like tufts of hair, growing from warts i and the upper parts of ii; pale brown or black on joints 5 and 6, yellowish and smaller on joints 7 and 8. Warts iii-v whitish, the others blackish. Head 1.1 mm.

Fourth stage. — As in the third stage but the warts are colored as in the next stage. There are no traces of any lateral hair pencils on joints 5 and 6. Hair pencils over 1 mm. long; head 1.55 mm.

Fifth stage. — Head shiny black, labrum paler; width 2.1 mm. Body dark gray, with a dorsal black band, narrow anteriorly and dividing a dorsal whitish patch, broad on joints 5 to 8 and narrower on joints 9-13. Venter pale as are the feet. On joint 9 dorsally, some orange streaks. Warts ii, iii pale orange, v yellowish, vi largely black [i and iv are so small as to be obscure]. Brush

*Mr. Edwards says that the eggs are "surrounded by hairs from the body of the mother," but this is not so. The moth is not supplied with the necessary amount of hair.

tufts on joints 5 and 6 white, brownish or black, on joints 7 and 8 pale yellow or white. Pencils about 1.5 mm. long preceded by some shorter, but equally black hairs. Other hair blackish and yellowish mixed. Retractable tubercles orange red.

Sixth and seventh stages (the 7th in some ♀ larvae).—As before, except the brush tufts are all alike, brownish white, darker along the crest. There is a yellowish band subdorsally on joints 11 and 12, and a sub-stigmatal one, broken on each segment, but reaching the whole length.

Cocoon.—As in all the other species of this genus.

Pupa.—Structurally as in the other species. Smooth, yellowish white, with more or less black shading on the back, in some covering most of the surface and extending on the under side. A few silky white hairs over the surface and in some three tuft-like structures on the back.

Length ♂ 10 mm., ♀ 18 mm.; width ♂ 3.5, ♀ 5.5 mm.

Larvae from Nanaimo, B. C.

ORGYIA ANTIQUA Linn.*

nova Fitch.

Egg.—As in *O. badia*; laid without covering.

First stage.—Like *O. badia*.

Second stage.—As in *O. badia*, but there are a few short black hairs from the dorsal warts on joints 5-8. The orange retractile tubercles now first appear.

Third stage.—The hair pencils are now present, 1 mm. long; also the brush tufts, those on joints 5 and 6 black on joints 7 and 8 white, the one on joint 8 consisting of only a few hairs.

Fourth stage.—Body black, the warts ii and iii red; hair pencils 2.5 mm. long, black.

* In Ent. Amer. Mr. Edwards describes accurately stages i to iii of *O. nova* and then says there is no change to maturity. This may be an oversight as the lateral pencils do not appear till stage iv. But his statements would imply that he was describing *O. badia*. The larvae were from Houghton, Mich.

From wart v on joint 5 is a white hair pencil, not plumed; from wart v on joint 6 a plumed black one, both these 1.5 mm. long. These lateral hair pencils are not seen in *O. badia*, which the larva otherwise closely resembles.

Fifth stage.—As before. The brush tufts on joints 5 and 6 are faintly brownish, on joints 7 and 8 yellowish, but nearly the same color. The markings are as in *O. badia*.

Sixth and seventh stages (7th stage some ♀ larvae).—Head shining black, labrum and bases of antennae white; width 2.8 mm.; and 3.5 mm. in the seventh stage. Body dark gray, paler below, legs flesh color. It is marked as in *O. badia*. There is a pair of plumed black pencils from wart ii on joint 2, from wart v on joint 6 and a single one dorsally on joint 12; also a pair of simple white pencils from wart v on joint 5, and in one example an additional pair of black plumed pencils from wart v on joint 7, distinct and only a little shorter than the others. Some short brown hair precedes the black pencil on joint 12. Brush tufts yellowish white or whitish brown, darker along the crest.

Cocoon and pupa as in *O. badia*.

Larvae from Port Townsend, Wash., Plattsburgh, N. Y. and Campton Village, N. H.

ORGYIA LEUCOGRAPHA Geyer.

1832, Geyer, Zutr. Samml. exot. Schmett., 33: 373, f. 745-6, *Cladophora*.

1856, Walker, Cat. Brit. Mus. vii, 1723, *Orgyia*.

1886, Hy. Edwards, Ent. Amer., ii, 13.

1891, Smith, List lep., No. 1155.

This can hardly be anything else than *O. leucostigma* S. & A.† I have not seen the

† Since the above went to the printer, I have examined the figure of *leucographa* in the copy of the Zuträge in the Harvard College library and find that it represents *O. leucostigma* S. & A. The varietal name proposed by Hy. Edwards for the form without the white spot, viz., var. *obliviosa*, will stand as valid. It will prove that this has been redescribed by Mr. Beutenmüller (Payche, v. 5, p. 300) as the only character for specific separation between *obliviosa* and *inornata* is the difference between "yellow" and "orange" in the coloration of the warts of the larvae.

original figure, but Walker's diagnosis is no different.

ORGYIA SP. Packard.

1890, Packard, 5th rept. U. S. ent. comm., p. 774.

Dr. Packard describes a larva appearing much like *O. antiqua*, but says: "It differs from *O. leucostigma* in having a pair of large prothoracic lateral black pencils" [besides the usual subdorsal ones?] and there are "three coral retractile warts." I would like to call particular attention to this form. It evidently differs structurally from any of the known North American Orgyia in having three instead of two retractile tubercles, besides apparently having two pairs of hair pencils on joint 2. It must be an undescribed species. The larvae were found on pine.

The following table will serve to distinguish the mature larvae of Orgyia.

Head red.

Warts pale yellow *leucostigma* S. & A.

Warts orange *inornata* Beut.

Head yellow *definita* Pack.

Head black.

Without lateral tufts on joints 5 and 6.

Pencil on joint 12 yellow, tufted with black *vetusta* Boisd.

Pencil on joint 12 black, perhaps preceded by brown.

Three yellow lines on each side *gulosus* Hy. Ed.

Two yellow lines on each side.

Warts bright crimson

cana Hy. Ed.

Warts orange or yellowish

badia Hy. Ed.

With lateral tufts on joints 5 and 6.

Two retractile tubercles *antiqua* L.

Three retractile tubercles *sp.* Pack.

SYNOPSIS OF THE N. AMERICAN SPECIES OF MEGACILISSA.

BY WM. J. FOX, PHILADELPHIA.

Labrum biridged, or strongly furrowed down the middle.

Wings not or but slightly fuscous apically.

Abdomen dorsally, with exception of first segment entirely black, with black pubescence. . . . *electa* Cr. ♂.

Abdomen dorsally black, with the apical margins of segments 2-4 with white pubescence. . . *Yarrowi* Cr. ♀ ♂.

Abdomen greenish, without white fasciae. . . . *mexicana* Cr. ♀.

Wings on apical half blue-black; legs reddish; abdomen black, on the sides, beneath and the sixth and seventh dorsal segments with fulvous pubescence. . . . *gloriosa* n. sp.

Labrum not ridged or furrowed, at the most swollen basally; abdomen fasciate; legs brownish, with brownish pubescence; wings with a yellow tinge *eximia* Sm. ♂.

Megacilissa gloriosa ♀. — Labrum with a long, narrow, medial furrow; clypeus with strong, close punctures, those in the middle confluent and forming transverse rugae; ocelli situated very low down, the anterior one separated but little from the hind margins of the clypeus and is connected with it by a furrow; vertex and cheeks with rather fine, close punctures, those on the cheeks finest and sparsest; first joint of flagellum fully as long or a little longer than the following five joints united, joints 2-5 shortest and about equal in length; tarsal claws armed with a long, acute tooth, in shape somewhat similar to the claw itself; dorsal abdominal segment finely and closely punctured, except apical portion of segments 1-4, which is depressed and impunctate; enclosure on last dorsal segment strongly furrowed along the lateral borders. Black; tegulae and legs, except the four anterior femora in part, ferruginous;

head (except a few nude places as the sides offront, top of vertex and the labrum medially), the thorax densely, legs, dorsal segment one in front, and 1-4 on sides, the fifth and sixth entirely and the greater part of ventral segments, with dense fulvous or golden-ochraceous pubescence, darkest on top of thorax; fore-wings on basal half sub-hyaline, or with a yellowish tinge, the apical half bluish-black, first recurrent nervure, uniting with the second transverse-cubital nervure, first submarginal cell the smallest, the third largest, marginal cell very long and narrow, hind wings subhyaline. Length, 22 mm.

Las Cruces, N. Mex. (*Aug. 21, C. H. Tyler Townsend*). Will be at once distinguished by the extremely low position of the ocelli and the bluish-black wings.

MISCELLANEOUS NOTES.—The West African moths figured on Plate 10 in the present number illustrate Dr. W. J. Holland's article; they are the following. Fig. 1. *Lomodonta erythrina*; 2. *Heteronygmia stigmatica*; 3. *H. argiloides*; 4. *H. clathrata*; 5. *H. arctioides*; 6. *H. basibrunnea*; 7. *Laelia hypoleucis*; 8. *L. ocellata*; 9. *Aroa nigripicta*; 10. *Dasychira*

sublutescens; 11. *D. ruptilinea*; 12. *D. congia* Druce; 13. *Aroa lata*; 14. *Heteronygmia hypoxantha*; 15. *H. rhodapicata*; 16. *Artaxa nigra*; 17. *Laelia lignicolor*; 18. *Euproctis Reutlinger*; 19. *Euproctidion Gabunica*; 20. *Artaxa mesomelaena*; 21. *A. parallela*; 22. *A. discipuncta*; 23. *A. palla*; 24. *A. melaleuca*; 25. *A. rotundata*; 26. *A. apicipuncta*; 27. *Balacra rubricincta*; 28. *B. glagoessa*; 29. *B. damalis*; 30. *Casphalia nigerrima*; 31. *Anace monotica*; 32. *A. parachoria*; 33. *Apisa cana*; 34. *Alpenus multiscripta*.

In the line of J. B. Smith's studies on the mouth-parts of Diptera, Dr. S. W. Williston in the Kansas University quarterly for January describes these organs in the Apioceridae and allied families.

An illustrated and descriptive list of the galls, 88 in number, found in the vicinity of New York, is given by W. Beutenmüller in the Bull. Amer. mus. nat. hist., v. 4; 42 are hymenopterous, 34 dipterous, 11 hemipterous and 1 arachnid.

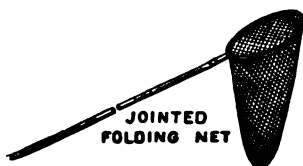
Details of the anatomy of certain species of Orthoptera are given by J. B. Smith in Bull. 90 of the New Jersey experiment station.

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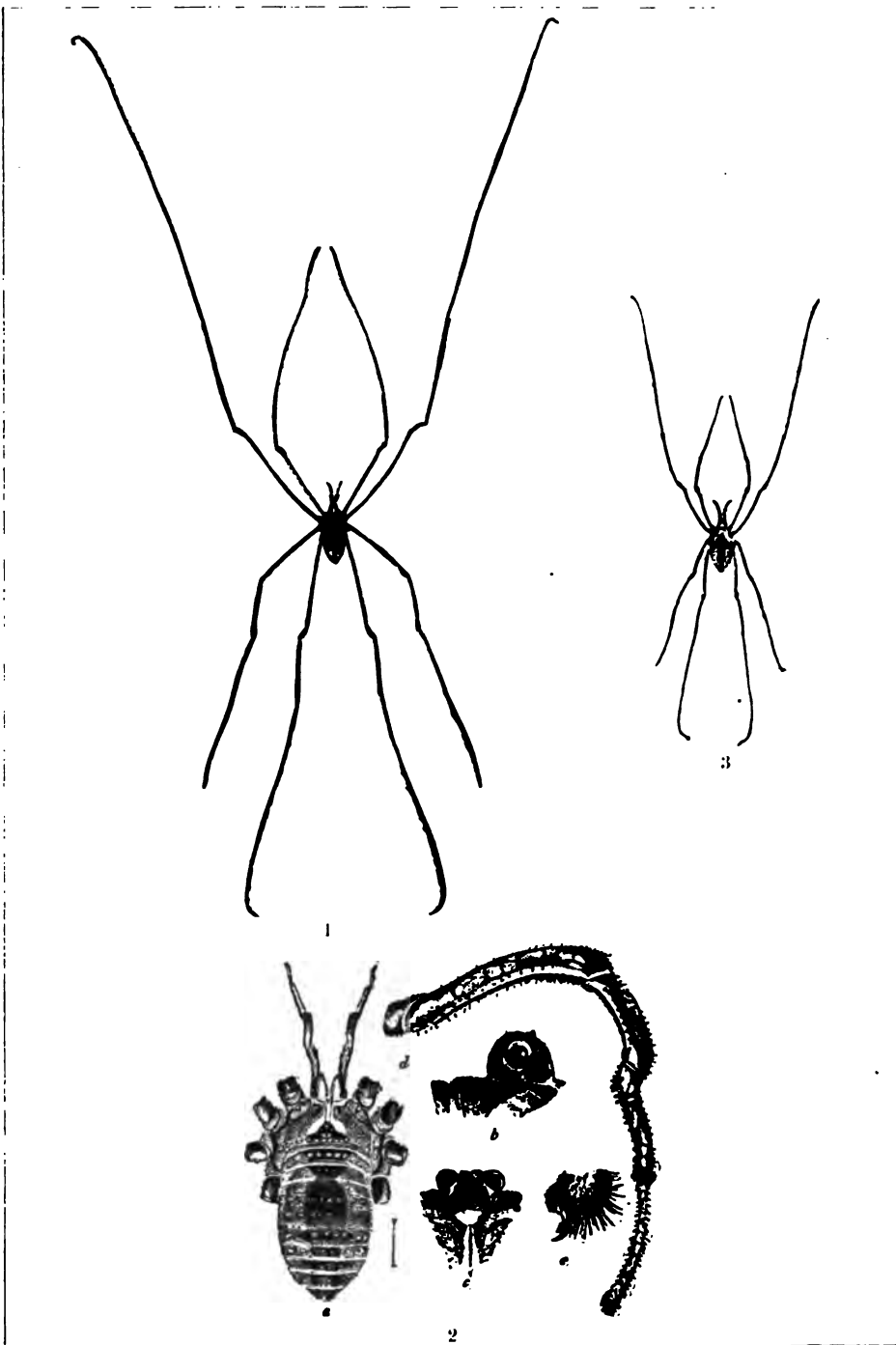
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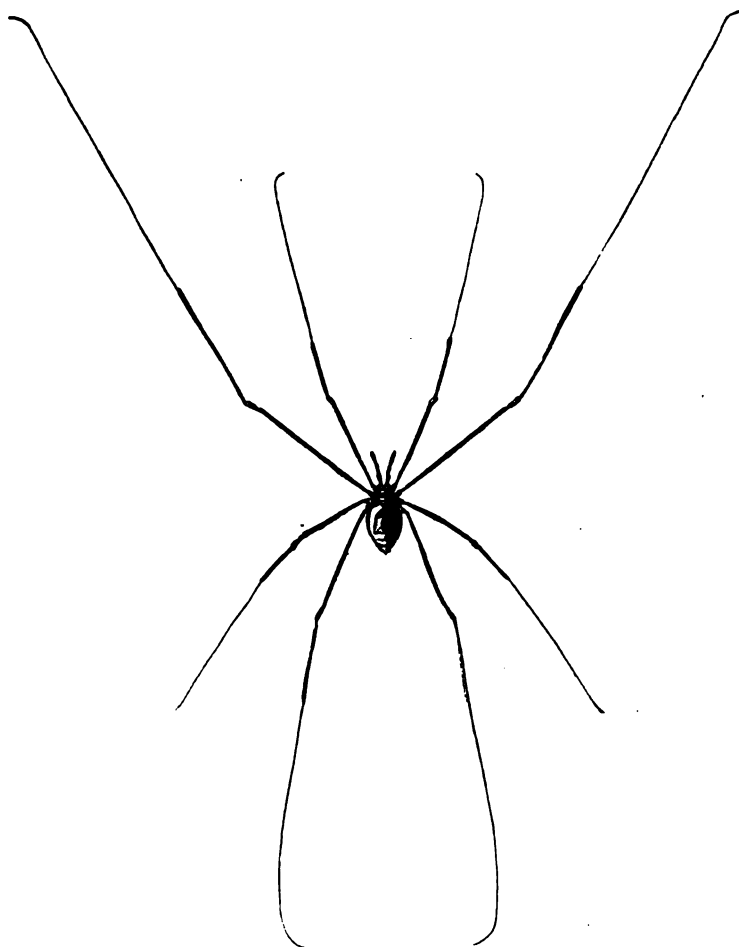
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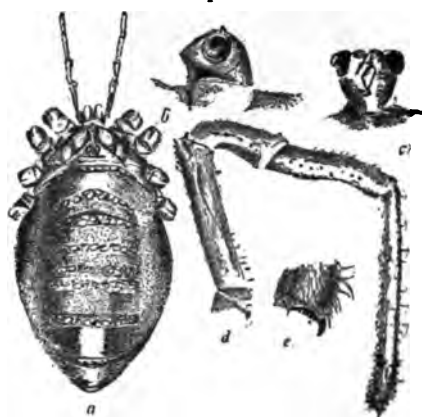
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Liobunum vittatum (Say), ♂.

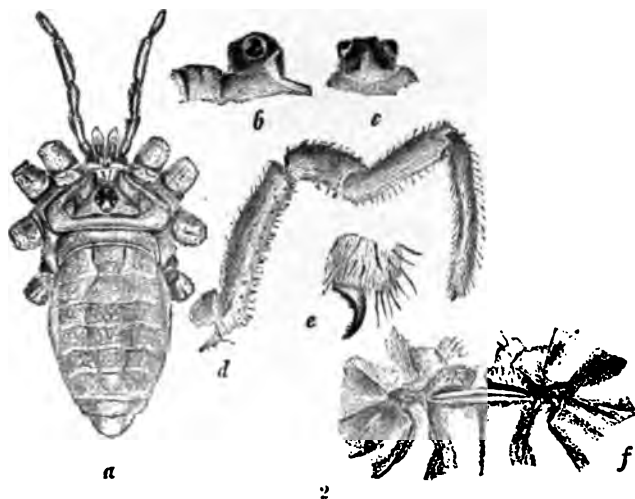
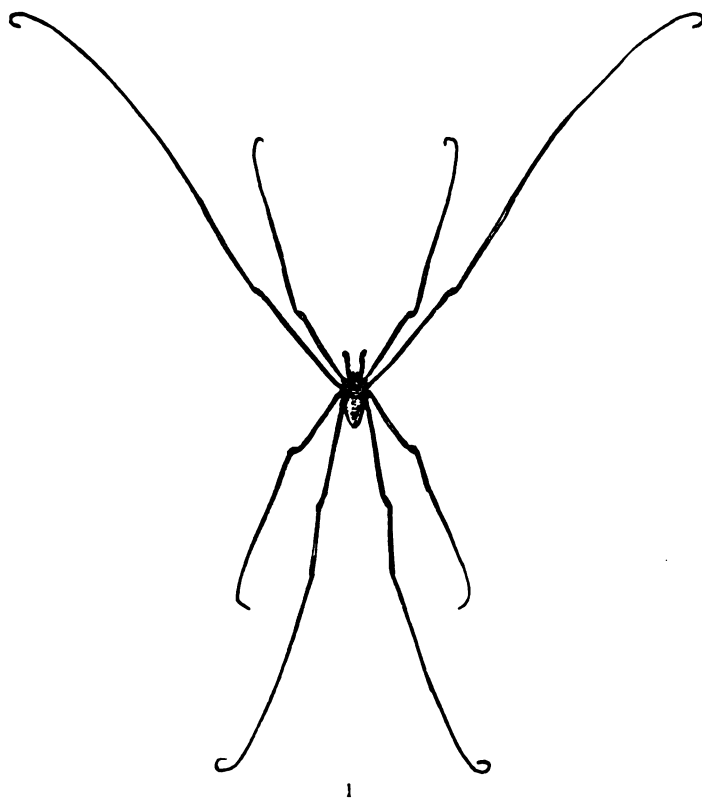


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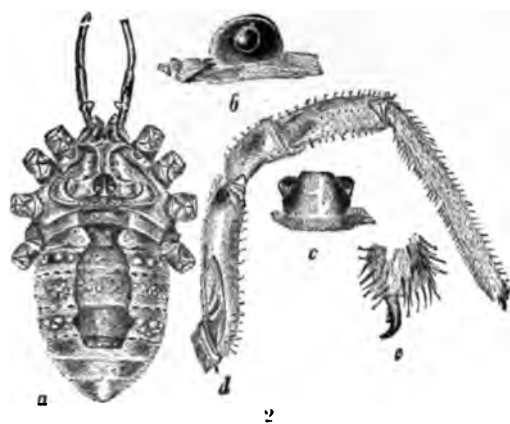
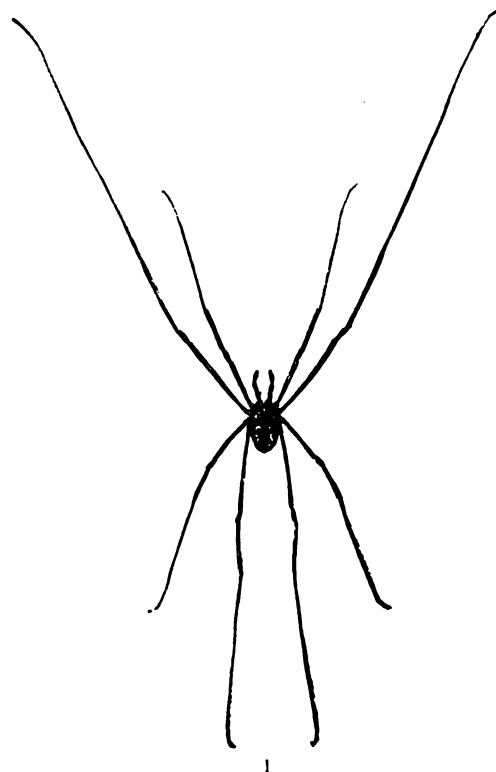


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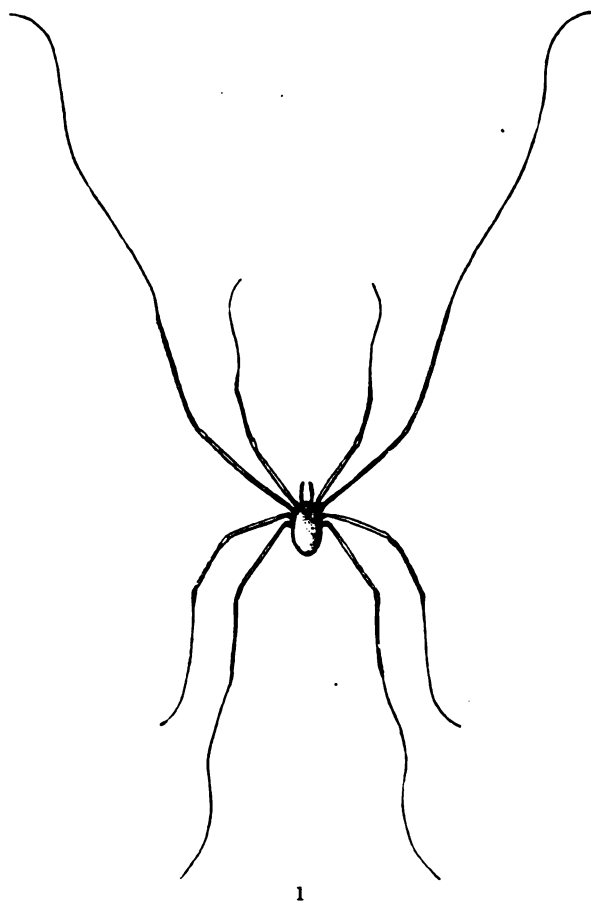
Liobunum vittatum (Say), ♀.



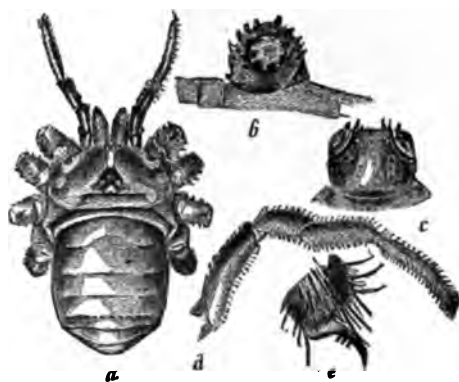
Liobunum ventricosum (Wood).



Liobunum ventricosum hyemale (Immature).



1



2

Liobunum politum and *L. politum magnum*.

PSYCHE.

A PRELIMINARY SYNOPSIS OF THE HARVEST-SPIDERS (*PHALANGIIDÆ*) OF MISSISSIPPI.

BY CLARENCE M. WEED, HANOVER, N. H.

The present paper is based upon a collection of Phalangiidae kindly sent me at various times during the last three years by my brother, Mr. Howard Evarts Weed, of the Mississippi Agricultural College. Nearly all of the specimens were taken in the vicinity of the College, which is located in Oktibeha County, a little north of the center of the State, so that the northern and southern extremities of Mississippi are not represented. This probably accounts, in part at least, for the fact that in the large number of specimens collected only three species are found.

The most remarkable thing connected with these phalangiids is the large size of their bodies and the length of their legs. Each form is the southern representative of a northern species in which the body is smaller and the legs are larger. I presume this variation in size is due to the longer period of growth and feeding at the south, but the discussion of variations is not the purpose of the present paper.

Family PHALANGIIDÆ.

Subfamily PHALANGIINÆ.

Arachnids having the body composed of a single piece, and long, slender legs. The teguments are not coriaceous, though often

quite solid. The segments are only indicated by striae, which are often obsolete. There are five ventral abdominal segments; a single anal piece, and two distinct lateral pores on upper margin of cephalothorax. The maxillary lobe of the palpus has two tubercles. The two eyes are placed upon a blunt tubercle (the eye-eminenence) on the median line of the cephalothorax not far from its front margin.

The three Mississippi forms all belong to the single genus *Liobunum*, the principal characters of which are the following:—

Anterior and lateral borders of the cephalothorax smooth. Eye eminence relatively small; smooth, or rarely provided with small, slightly distinct tubercles; widely separated from the cephalic border. Lateral pores small, oval, and marginal. Anal piece large, transverse-oval or semi-circular, much wider than long. Mandibles short, similar in the two sexes; first joint furnished at the base below with an acute tooth. Palpi simple; femur, patella and tibia without any process and without projecting angles; maxillary lobe provided at the base with two strong, conical teeth. Maxillary lobe of the second pair of legs very long, nearly straight from the base, not attenuated, directed mesad nearly horizontally, and united on the ventromeson to the lobe from the opposite side without forming a sensible angle; the two together lightly arched on the cephalic border, and forming an even curve. Sternal piece large, slightly contracted between the

fourth pair of coxae, gradually enlarging and obtusely truncate cephalad. Feet very long and slender; tibia of the second pair with a few false articulations. Palpal claw denticulate.

The three forms described below may be distinguished as follows:—

Body and legs cinnamon-brown.

L. ventricosum hyemale.

Eye eminence with a regular row of tubercles over each eye; dorsum with no black marking in males, and indistinct one in females. . . . *L. politum magnum.*

Eye eminence with very few tubercles; a distinct black, longitudinal marking on dorsum. . . . *L. vittatum.*

LIOBUNUM VITTATUM (Say).

The Striped Harvest-spider. Plates 11, 12.

Phalangium vittatum. Say, Journ. Phila. Acad., II, p. 65, 1821; Wood, Comm. Essex Inst., VI, pp. 20-21.

Liobunum vittatum. Weed, Amer. Nat. XXI, p. 935; XXVI, p. 999.

MALE.—Body 7 mm. long; 4 mm. wide. Palpi 7 mm. long. Legs: first, 44 mm.; second, 89 mm.; third, 45 mm.; fourth, 64 mm.

Dorsum reddish-brown, with a dark central marking, commencing at eye eminence and extending backward to the ultimate or penultimate abdominal segment. Contracting slightly near the anterior margin of abdomen, then gradually expanding until about the beginning of the posterior third of the abdomen, where it again slightly contracts. Ventrums slightly paler than dorsum, both finely granulate. Eye eminence a little wider than high, black above, canaliculate, with small black tubercles over the eyes. Mandibles light yellowish-brown, tips of claws black; second joint with short sparse hairs. Palpi long, reddish-brown; tarsal joints paler. Femur and patella arched, with two rows of rather blunt dark tubercles, on the outer

ventro-lateral surface; femur also having a few small subobsolete ones on its dorsal surface. Tibia with a similar row on its outer ventro-lateral surface, a short row on the distal portion of its inner ventro-lateral surface, and a short row on the proximal portion of its ventral surface. Tarsus pubescent, with a row of short, blunt, black tubercles on its inner ventro-lateral surface, extending from the base to near the apex. Legs varying from light brown to black, but patella is generally black and tarsi brown, the other joints varying. Coxae reddish-brown, minutely tuberculate. Trochanters generally dark brown with minute scattered tubercles. Femora and patellae with rows of small spines. Tibiae with very short hairs. Shaft of genital organ slender, sub-cylindrical, not broadened distally, but bent at an obtuse angle and terminating in a very acute point.

FEMALE.—Body 8-9 mm. long; 5-6 mm. wide. Palpi 5 mm. long. Legs: first, 42 mm.; second, 90 mm.; third, 43 mm.; fourth, 61 mm.

Besides its rounder body and much more robust appearance, it differs from the male as follows: Dorsum of a much darker shade of brown with less of the reddish tint, and the ventrum paler. Second joint of mandibles with fewer hairs. Palpi shorter, more slender, with the rows of tubercles on the tibia subobsolete, and that on the tarsus entirely wanting. Legs generally light brown with black annulations at the articulations. Ovipositor whitish with no dark color in apical rings.

This species in Central Mississippi evidently passes the winter in the egg state, the young hatching in March, April and probably the early part of May, becoming fully developed in July and living until October or November. Specimens taken during October are very deeply colored. The collections

before me show very young to half-grown forms taken 30th May, 1891; some approaching maturity collected during June; and some fully developed but not fully colored taken in July. There appears to be but one brood a year so that the species has a very long feeding period.

In a recent paper in the American Naturalist (December, 1892) I have discussed at some length the geographical variations of this Striped Harvest-spider.

LIOBUNUM VENTRICOSUM HYEMALE, Weed.
Plates 13, 14.

Phalangium ventricosum Wood, Comm. Essex inst., VI, 32.

Liobunum ventricosum (Wood). Weed, Amer. nat., XXIV, 918; Trans. Am. ent. soc., XIX, 188.

Liobunum ventricosum hyemale Weed, Amer. nat., March, 1893.

MALE.—Body 9 mm. long; 6 mm. wide; palpi 8 mm. long. Legs: first, 52 mm.; second, 101 mm.; third, 50 mm.; fourth, 73 mm. Body elongate, abdomen subconical. Dorsum, legs including trochanters cinnamon-brown, ventrum of a slightly lighter brown, sometimes grayish brown. Dorsum closely granulate with an indistinct darker marking, and numerous small grayish spots arranged in irregular transverse series. Eye eminence black, except at base; rounded, not canaliculate, smooth, or with a few small, acute tubercles. Palpi rather slender, with none of the angles prolonged; femur with a very few small spinous tubercles and hairs; patella strongly, and femur and tibia slightly, arched; coxae minutely tuberculate, tipped with white; trochanters and legs cinnamon rufous; tarsi dusky. Legs long and moderately robust. Genital organ of male "flat, nearly straight, slender at the basal portion, gradually widening and distally rather

quickly expanded into a broad alate portion, and then abruptly contracted into a moderately robust, slightly curved point, which is placed at an angle to the rest of the shaft; at the base of the point a marked notch in the end of the shaft."

FEMALE.—Body 11 mm. long; 6.2 mm. wide. Palpi 7 mm. long. Legs: first, 48 mm.; second, 93 mm.; third, 46 mm.; fourth, 68 mm. Differs from the male in having a larger body, with the abdomen often greatly swollen.

This species passes the winter in a half-grown condition. The eggs are apparently laid during summer and hatch early in autumn. The length of the second pair of legs of young specimens, taken at the Agricultural College during October, 1892, varied from 15 millimetres to 33 millimetres. The size of early spring specimens is represented in plate 14, fig. 1; and the structural details in fig. 2 of the same plate. Such forms are described as follows:—

Length 7 mm.; width 4 mm. Legs: first, 32 mm.; second, 60 mm.; third, 31 mm.; fourth, 45 mm. Body soft. Dorsum smooth; mottled brown. A distinct dark central marking begins at eye eminence, and runs two-thirds of the way to the posterior extremity; it contracts near the anterior border of the abdomen, then expands in an even curve, and again contracts in a similar way. There is a deep oblique sinus just back of each lateral pore of cephalothorax. On the abdomen are scattered dark spots, arranged in irregular transverse series. Eye eminence perfectly smooth; black about eyes with a light brown longitudinal central marking; slightly longer than high; not at all canaliculate. Mandibles light gray, with tips blackish; sparsely provided with short black hairs. Palpi slender; mottled grayish-brown; all the joints provided with short, black, stiff

spinous hairs. Patella arched; its inner lateral distal angle produced into a pronounced conical tubercle. Tarsal claw distinctly pectinate. Ventral surface light gray. Legs long, rather stout; coxae light gray, remaining joints mottled cinnamon-brown.

The mature condition is reached early in summer. The Mississippi forms are somewhat larger than plate 13, fig. 1, which represents a specimen from a more northern locality; but the structural details are similar to those illustrated in fig. 2 of the same plate.

An account of the variations and synonymy of this species will be found in one of the earlier issues of the American Naturalist for 1893.

LIOBUNUM POLITUM MAGNUM, new subspecies.

MALE.—Body 5 mm. long; 4 mm. wide; palpi 3.8 mm. long. Legs: first, 40 mm.; second, 80 mm.; third, 40 mm.; fourth, 58 mm. Dorsum granulate; varying from light cinnamon-brown to reddish brown, with no markings except occasionally a faint indication of the usual central marking. Eye eminence prominent, slightly constricted at base, more or less black above, canaliculate, with a regular curved series of small, acute, blackish spines over each eye. Mandibles brownish white; tips of claws black. Palpi slender, light brown, with femur and patella sometimes dusky; finely pubescent, with a subobsolete row of minute dark tubercles on the inner ventro-lateral surface of femur, and another row on the inner ventro-lateral surface of tarsus; joints slightly arched. Ventrum with coxae, including the membranous distal lateral tips, and generally the trochanters, varying from light brown to vermilion red. Legs with proximal portions light brown; distally dark brown or blackish.

Shaft of genital organ nearly straight, slender, flattened, canaliculate; distal portion very slightly expanded, then slightly contracted, and again expanded into a half spoon-shaped portion, and terminating in a small acute point.

FEMALE.—Body 6.5 mm. long; 4.5 mm. wide; palpi, 3.6 mm. long. Legs: first, 39 mm.; second, 81 mm.; third, 39 mm.; fourth, 57 mm. Differs from the male in having a larger, rounder body; and in the color of the dorsum, which is brown, or reddish-brown, with a rather distinct, darker central marking and numerous whitish spots arranged more or less transversely. In some specimens the central marking and spots are obsolete. Apical rings of ovipositor white.

A few specimens of this form have been taken during June and July at the Agricultural College. A single female has also been collected at the same place in October. This is much more deeply colored than the others of this sex examined, being clear reddish brown, and having the central marking and white spots on dorsum obsolete. It is illustrated at plate 15, fig. 1, and the structural of the northern *L. politum* are shown in fig. 2 of the same plate.

EXPLANATION OF PLATES.

PLATE II.

Fig. 1.—*Liobunum vittatum*. Male. Natural size.

2.—Parts of same. Magnified.

2a.—Body.

2b.—Eye eminence. Side view.

2c.—Eye eminence. Front view.

2d.—Palpus. Side view.

2e.—Claw of palpus. Side view.

3.—*Liobunum vittatum dorsatum*. Male from Dakota. Natural size.

PLATE 12.

Fig. 1.—*Liobunum vittatum*. Female. Natural size.

- 2.—Parts of same. Magnified.
- 2a.—Body.
- 2b.—Eye eminence. Side view.
- 2c.—Eye eminence. Front view.
- 2d.—Palpus. Side view.
- 2e.—Claw of palpus. Side view.

PLATE 13.

Fig. 1.—*Liobunum ventricosum* (Wood), male. Natural size.

- 2.—Parts of same. Magnified.
- 2a.—Body.
- 2b.—Eye eminence. Side view.
- 2c.—Eye eminence. Front view.
- 2d.—Palpus. Side view.
- 2e.—Claw of palpus. Side view.
- 2f.—Maxillary lobe of second pair of legs.

PLATE 14.

Fig. 1.—*Liobunum ventricosum hyemale*. Immature. Natural size.

- 2.—Parts of same. Magnified.
- 2a.—Body.
- 2b.—Eye eminence. Side view.
- 2c.—Eye eminence. Front view.
- 2d.—Palpus. Side view.
- 2e.—Claw of palpus. Side view.

PLATE 15.

Fig. 1.—*Liobunum politum magnum*. Female. Natural size.

- 2.—*Liobunum politum*. Parts of male. Magnified.
- 2a.—Body.
- 2b.—Eye eminence. Side view.
- 2c.—Eye eminence. Front view.
- 2d.—Palpus. Side view.
- 2e.—Claw of palpus. Side view.

DESCRIPTION OF A NEW AND INTERESTING PHASIID-LIKE GENUS OF TACHINIDÆ S. STR.

BY C. H. TYLER TOWNSEND, LAS CRUCES, N. MEX.

During the last year, I have received, among several lots of flies from New Hampshire, a number of specimens of a tachinid s. str., which I at first mistook for a phasiid of the genus *Hyalomyia*. Upon examination, recently, the distinctness of the form was at once realized, but the great resemblance in almost every detail save one was very surprising. This one detail will, however, always be sufficient to distinguish it, and that is the presence of macrochaetae on the abdomen, a character possessed by no phasiid.

From its extreme resemblance to

Hyalomyia, I propose to call the new genus *Hyalomyodes*. The species may be known as *H. weedii*, in honor of Dr. Weed, in whose sendings my attention was first called to this interesting form.

HYALOMYODES nov. gen.

Head much like *Hyalomyia*; front very narrow, slightly widened at vertex, much more widened toward insertion of antennae, at narrowest about one ninth width of head in both sexes. Face widening from front at same angle as latter, so that the two opposite boundaries of the face and front diverge uniformly from each other from the narrowest part of the front to a point very near the oral

margin. Sides of face extremely narrow, cheeks but little wider, the eyes thus descending very nearly to oral margin. Oral margin distinctly protruded anteriorly, vibrissal angles situated distinctly above oral margin, facial ridges with only several small bristles above and immediately next to the vibrissae, which latter are not strong but are distinct from the row of other bristles below them, and slightly decussate. Antennae reaching a little more than half-way to the oral margin, third joint about once and a half as long as second. Arista bare, thickened on basal third, 1-jointed at extreme base. Frontal bristles rather weak, descending only to insertion of antennae. Proboscis not long, moderately stout, labella developed; palpi filiform, very slender but elongate. Thorax distinctly narrower than head, with a few bristles; scutellum subtriangular, with three pairs of bristles. Abdomen broad round-ovate, very distinctly wider than thorax, less broadened in ♂, vaulted, the tergum convex, venter almost always concave, furnished with rather numerous weak macrochaetae. Legs not stout, moderately long. Wings longer than abdomen, apical cell long petiolate, the petiole but little shorter than apical cross vein, fourth vein bent in a curve to third hardly more abruptly than in *Hyalomyia*. Hind cross vein nearly straight, longer than apical cross vein, nearer to small cross vein than to curve of fourth vein. Tegulae large, the upper scale about one fifth size of lower.

Hyalomyodes weedii nov. sp. Length of body, 4 to 4.5 mm.; of wing, 3.5 to 4 mm. Frontal vitta velvety black, taking up nearly all of front, widening behind and before with the width of front; the extremely narrowed sides of front, the sides of face and cheeks silvery white; facial depression silvery. Antennae and arista black, palpi fulvous. Thorax soft deep black, with a golden brown

shade in oblique lights, humeri and pleurae cream colored, or silvery with a slight golden shade. Scutellum wholly black. Abdomen black, second segment with a median vitta and a narrow anterior border silvery pollinose with a slight golden shade, the border widening laterally; third segment same, but with the pollinose border more widened and laterally reaching the posterior border of segment, thus leaving on the posterior half of the segment an irregular black area on each side of the pollinose median vitta; anal segment entirely pollinose. First segment with a median marginal pair of bristles, second with a median marginal and discal pair, third and anal segments each with a somewhat irregular discal and marginal row of weak macrochaetae. Legs black; claws and pulvilli short in ♀, a little elongate in ♂. Wings hyaline, slightly grayish; tegulae tawny yellowish, halteres pale fulvous.

There seems to be little difference between the sexes, the ♂ having the claws a little elongate while there is no appreciable difference in width of front. Described from three specimens, 2 ♀ and 1 ♂, Hanover, N. H., from Dr. C. M. Weed; and 2 ♀, Franconia, N. H., from Mrs. A. T. Slosson. I have seen this peculiar fly as yet only from New Hampshire.

NOTE.—Since sending the above in for publication, I have found in a sending from Mr. C. W. Johnson, of Philadelphia, two more specimens of this fly. One of these is a ♂, from Franconia, N. H., collected by Mrs. Slosson. The other specimen is from Montgomery County, Pennsylvania, and was collected July 17.

(Continued from page 418.)

♀. The female only differs from the male in its larger size, the greater obscurity of the median band on the primaries, and the greater distinctness of the subapical marks.

Expanse, ♂, 25 mm.; ♀, 32 to 38 mm.

LAELIA, Steph.

86. *L. hypoleucis*, sp. nov. ♂. Front whitish. Antennae testaceous. Thorax and the forward portion of the abdomen on the upper side vinaceous. The abdomen at its extremity is tipped with white. The lower side of the body is whitish. The legs are pale fawn. The primaries are vinaceous with a darker longitudinal streak running from the base below the cell and curving outwardly toward the apex. The costa near the base and the apex are whitish. There is a small spot in the middle of the cell, a somewhat larger spot at the end of the cell followed by a zigzag very narrow, transverse limbal line, which beginning on the costa three-fourths of the distance from the base runs inwardly to the middle of the inner margin. That portion of this line which lies between the submedian and the first median assumes the form of a V-shaped mark with its point turned outwardly. In some specimens there is a faint curved transverse basal line. The markings of the primaries are somewhat variable and in some instances the large spot at the end of the cell in the primaries is obsolete. The secondaries are uniformly pure white above, and both primaries and secondaries are white below with the fringes of the primaries light brown checked with gray.

♀. Like the male, but the markings of the fore wings in the specimens before me are more obscure.

Expanse, ♂, 33 to 40 mm.; ♀, 45 mm.

87. *L. (?) barsineides*, sp. nov. ♂. Antennae long, culmen white, and pectinations grey. Palpi and head pale luteous.

Abdomen brown above. Thorax and abdomen pale yellow beneath. Legs pale luteous, the tibiae encircled on the middle by a brown band. The primaries are pale luteous marked with ferruginous, somewhat after the style of some species of *Barsine*. There is a broad ferruginous subbasal band, an oblique oval annular spot at the end of the cell and a small spot above it on the costa. A broad irregularly curved and geminate ferruginous submarginal band runs from the apex to the inner margin followed by faint brownish marginal lines. The secondaries are uniformly pale buff, semi-translucent. The under sides of both wings are pale buff, the markings of the upper side of the primaries being faintly indicated on the under side. Expanse, 23 mm.

I refer this species with some doubt to the genus *Laelia*, owing to the fact that the antennae are heavier than in most species of the genus, and the wings are narrower than in typical *Laelia*.

88. *L. lignicolor*, sp. nov. ♂. Palpi, front, and thorax pale reddish-brown, abdomen paler. Body whitish beneath. Legs pale fulvous. The primaries are wood-brown with the basal third darker, a darker spot at the end of the cell, and a broad diagonal line running from the apex to the middle of the base followed by a curved series of small black dots running likewise from the apex to the inner margin. The posteriors are uniformly reddish-buff. The under side of both wings is pale buff. The secondaries have a discal dot at the end of the cell and an obscure submarginal series of fuscous markings. Expanse, 27 mm.

89. *L. setinoides*, sp. nov. ♂. Palpi, front, and thorax pale luteous. Abdomen pale fawn, under side lighter. Legs and antennae concolorous. The primaries are pale luteous with a small brown dot beyond the end of the cell followed by another near the apex and with three similar spots, one

below the cell before the origin of the first median, the others on the middle of the median interspaces. The secondaries are whitish, semi-diaphanous. The under side of the wing is much as the upper side with the dots on the primaries less distinct. Expanse, 25 mm.

90. *L. ocellata*, sp. nov. ♂. Palpi pale brown, tipped with orange. Front luteous. Antennae with the culmen whitish, the pectinations gray. Thorax vinaceous. Abdomen brown above. Lower side of body whitish. Legs pale fawn marked with light reddish. Primaries wood-brown with a small black spot below the cell near the base and a large brown spot at the end of the cell, which is accentuated on the lower side by a white semi-circle, and has in it one or two small black marks. Beyond this is a very narrow brown line beginning on the costa three-fourths of the distance from the base curving inwardly regularly to a point below the cell, and then running diagonally to the inner margin at a point one third of the distance from the base. The apex is marked with a subtriangular diffused whitish spot, which is crossed by a subapical series of three black points. The fringes are concolorous checked with dark brown. The upper side of the secondaries is pale ochraceous with a submarginal band of fuscous markings. On the under side both wings are very pale buff. Both have a large discal spot at the end of the cell, and both have a submarginal band of blackish dots and lines. The fringes are as upon the upper side. Expanse, 28 mm.

AROA, Walk.

91. *A. nigripicta*, sp. nov. ♂. Antennae testaceous. Body blackish with the segments of the abdomen marked with whitish. The under side of the body is white. Legs white, the femora and tibiae margined with black. Tarsi ringed with black. Primaries smoky-black crossed near the middle by two curved

bands of darker black and with some obscure whitish markings near the inner margin. Secondaries white, fuscous at the base, with the outer angle broadly tipped with black and the outer margin spotted with black. On the under side the primaries are whitish at the base and on the inner margin, while the apical half is black. The apex at the tip is slightly paler. The secondaries are as on the upper side. Expanse, 34 mm.

This species is allied to *A. terminalis*, Walk., but is very distinct.

92. *A. lata*, sp. nov. ♀. Antennae testaceous. Front white. Palpi white tipped with dark gray. Patagia white, each with a small black spot in the middle. Thorax and abdomen whitish above, white beneath. Primaries white with a double transverse basal line; a dark oval mark in the middle of the cell; a broad transverse band beyond the end of the cell curved and scalloped outwardly and inwardly; beyond these a series of moderately large and somewhat diffuse submarginal hastate markings. The margin has a blackish dot at the middle of each interspace. The secondaries are pure white with faint brownish marks on the margin at the middle of the interspaces. The under side of both wings is white. The primaries have a slight subapical brown shadow upon the costa and a series of brown marginal spots on the interspaces. The secondaries have similar marginal spots, but much smaller and less distinct than on the primaries. Expanse 42 mm.

LIPARIS, Ochs.

93. *L. (?) muscosa*, sp. nov. ♂. Antennae testaceous. Palpi and front dark brown. Upper side of thorax and abdomen gray. The abdomen with two black tufts on the dorsal line behind the thorax. Under side of the body paler. Legs whitish, banded with dark brown. Primaries pale greenish-gray with an oblong lunular brown mark at the end of the cell, some brown marks at the base suc-

ceeded by a transverse zigzag brown line running from the costa to the middle of the inner margin but interrupted below the median nerve. Beyond the cell there is a transverse limbal line, which runs irregularly from before the apex to the inner margin two-thirds of the distance from the base. This is succeeded by a submarginal line very irregular and produced to the outer margin above the radial, between the second and third median nervules, and near the outer angle. The fringes are concolorous. The upper side of the secondaries is pale fuscous, darker towards the base. The under side of both primaries and secondaries is fuscous-ochraceous. Expanse, 55 mm.

94. *L. hylomima*, sp. nov. ♂. Palpi brown, margined below with reddish. Front pale reddish-brown. Collar pale brown, margined inwardly with dark brown. Patagia brownish, margined externally with dark brown and fringed at the ends with long yellowish hairs, which are black near the base. The upper side of the abdomen is pale fulvous with two tufts of brown hair on the dorsal line. The lower side of the body is yellowish-ochraceous. The legs are concolorous, ringed with dark brown. The primaries on the upper side are brown, clouded with darker brown on the costa and at the end of the cell. There is a double curved basal line succeeded by a similar transverse line before the middle of the wing, bounded externally and internally by a paler shade. There is at the end of the cell a large irregular oval annular mark deep black defined outwardly by a narrow pale line. The apical area is lighter in color than the rest of the wing. The limbal area is crossed by an irregularly curved and angulated transverse line beyond which is a series of hastate marks with the points turned inwardly. These hastate marks are alternately pale creamy and deep black, and are succeeded by a brown band, which is followed upon the margin by a series of black hastate marks with their points turned outwardly, each de-

fined inwardly by a narrow creamy line. The fringe is brown, checked upon the nervules with black. The secondaries are uniformly dark fuscous. The fringes are as upon the primaries. The lower side of the wings is uniformly fuscous, tinged with ochraceous at the base, with darker median and submarginal cloudings. The dark mark at the end of the cell of the primaries reappears upon the lower side faintly.

♀. Female like the male except that the antennae are simple and not heavily pectinated, and this sex is nearly twice the size of the male. Expanse, ♂, 53 mm.; ♀, 90 mm.

This insect is congeneric with the insect recently described as *Liparis Preussi*, Stgr., by Mabille in the "Novitates Lepidopterologicae." Mr. Butler has suggested to me the erection of a new genus for its reception. It appears, like *L. Preussi*, to be moderately rare.

DASYCHIRA, Hübn.

95. *D. sublutescens*, sp. nov. ♂. Palpi, front, pectus, and upper side of thorax and abdomen fawn colored. The lower side of the abdomen is ochraceous. The primaries are pale fawn with an annular mark at the end of the cell preceded and succeeded by irregularly curved and angled transverse lines. There are a series of dark zigzag marks upon the costa, a basal geminate transverse line, a submarginal series of hastate spots, succeeded by a marginal series of similar spots. The fringes are pale gray checked with fawn. The secondaries are pale ochraceous at the base clouded with fawn on the outer margin. The fringes as upon the primaries. On the under side, both wings are pale ochraceous clouded with pale fuscous on the outer margin.

♀. The female is very like the male, but larger, with the abdomen above as well as below tinged with ochraceous.

Expanse, ♂, 43 mm.; ♀, 53 mm.

96. *D. ruptilinea*, sp. nov. ♂. Antennae, front, palpi, the upper side of thorax and abdomen brown. The under side of the thorax and the abdomen pale brown. The legs are concolorous, with the tibiae and tarsi annulated with dark brown. The primaries are dark brown with a pale reddish spot near the middle of the cell and a curved limbal band of the same color extending from the costa before the apex to about the first median. There is a narrow black submarginal line sharply produced toward the margin opposite the end of the cell and at the extremity of the third median. A very dark brown line runs from the base of the wing parallel to the inner margin to near the extremity of the submedian. It is interrupted about the middle of the wing and accentuated near its outer extremity by a small white dot. There are also some dark markings upon the costa and a black spot of raised scales at the end of the cell. The fringes are pale brown checkered with darker brown. The secondaries are uniformly grayish-brown with the fringes faintly checkered as the primaries. Both wings on the under side are pale brown with a large diffuse dark spot at the end of the cell, and with a broken submarginal series of spots upon the secondaries.

♀. The female has the markings much more distinct and larger than the male, and on the secondaries upon the under side there is a transverse median band of dark spots in addition to the submarginal band. Expanse, ♂, 38 mm; ♀, 55 mm.

97. *D. albosignata*, sp. nov. ♀. Allied to *D. Saussurei*, Dewitz. The body and its appendages are cinereous. The primaries are cinereous with a dark spot at the base followed below the cell by a dark brown marking, which is defined externally by a curved line, running to the inner margin. At the end of the cell, there is a pale gray spot succeeded by a series of dark brown lunulate markings running from the costa before the apex to the inner margin. Beyond these markings be-

tween the first median and the submedian there is a subtriangular spot above which there is a broad brownish limbal shade. There are some irregular submarginal hastate lines and marks, and the margin, which is dark brown, is interrupted with pale cinereous at the ends of the nervules. The secondaries are uniformly cinereous with the fringes marked as the primaries. On the under side the wings are cinereous with an obscure dark shade on the primaries beyond the end of the cell, and an incomplete limbal line running from the costa parallel to the outer margin as far as the first median. The secondaries have a dark spot at the end of the cell and an incomplete submarginal band near the outer angle. Expanse, 63 mm.

98. *D. (?) apateloides*, sp. nov. ♀. The front and the upper side of the thorax and abdomen pale gray. The under side of the abdomen and appendages white. The primaries are grayish-white with a narrow line of black raised scales at the end of the cell followed by a transverse line of similar raised whitish scales, defined outwardly by dark brown and running from the costa before the apex to the inner margin. This transverse band is succeeded by a submarginal irregular series of lunulate dark lines defined inwardly by whitish markings. The outer margin has a line of dark points on the intraneural spaces defined inwardly by whitish subhastate markings. The fringe is whitish. The secondaries are cinereous with the fringe whitish. On the under side the primaries are pale brownish-cinereous with the costa and the fringe narrowly white and the inner margin broadly whitish. The secondaries on the under side are uniformly white. Expanse, 44 mm.

NOTOHYBA,* gen. nov.

Allied to *Ilema*, Moore and *Oecura*, Holl. ♂. Palpi short, compressed, the first joint small; the second joint relatively very large.

* *Nōros* = *dorsum*, *ῥῆος* = *gibber*.

SOME NOTES ON THE EARLY STAGES, ESPECIALLY THE CHRYSALIS, OF A FEW AMERICAN SPHINGIDAE.

BY SAMUEL H. SCUDDER.

The subjoined descriptions are wholly from notes taken twenty or thirty years ago, and complement in part the larval descriptions given in B. P. Mann's paper in the second volume of *Psyche*.

MACROSILA CAROLINA.

Egg. Round, very light green, and perfectly smooth so far as can be seen with an ordinary lens. They are laid singly, and rarely more than one is found upon the same plant.

Caterpillar. (See *Psyche*, v. 2, p. 73-75, for description of the larva, drawn up at the same time.)

Chrysalis. Dark reddish brown with a slight dark olivaceous tint on the wings, the edges of the segments darker than the middle; spiracles and tongue black. The body is deeply hollowed at the metathorax on either side of the centre, somewhat constricted at the prothorax, and has a central depressed line and a pit on either side of it upon the front of the fifth and sixth abdominal segments. Metathorax and hind wings not very conspicuous, the former with a transverse backward directed ridge. The tongue is free except at its bulbous tip, shorter than in *M. quinquemaculata*, and slightly incurved on its downward trend; its extreme tip is placed at one-third the distance from the head to the tip of the body and halfway between the front of the head and the tip of the wings, while in *M. quinquemaculata* it is at half that distance. The hind legs reach the tip or nearly the tip of the wings which extend over four abdominal segments. Before the spiracles on the 5th-7th abdominal segments there is a slit five or six times

as long as the spiracles, the posterior edge raised and lipped, and the top ridged above, the whole being black, and undoubtedly serving for the movement of the pupa in reaching again the surface of the ground; precisely the same thing occurs in other species of *Macrosila*. The head, thorax, and appendages are quite smooth, being only faintly wrinkled, except the tongue which is roughly wrinkled; the abdominal segments are profusely punctate anteriorly, punctate or rather pitted and wrinkled in the centre and, at least on the 4th-7th segments, very minutely and delicately punctate posteriorly: the last two segments are very deeply erose; the cremaster obtusely conical, transversely compressed, having two short points with their inner edges diverging, but their outer edges nearly parallel. Length 50 mm.; breadth 14 mm.

Some caterpillars which went under ground about August 27 had not changed on September 5, but changed within eight days thereafter. They seldom bury themselves more than three or four inches, and make an underground cavern with sides of packed earth.

SPHINX CINEREA.

Chrysalis. Mahogany brown, edges of segments slightly darker. Body a little hollowed on either side of the metathorax and slightly constricted at the prothorax. Metathoracic wings visible down to the spiracle of third abdominal segment. Tongue detached, heavily wrinkled, carried along the front nearly parallel to the breast, the tip not

bulbous and placed slightly more than a fourth way down the length of the body; the same structure before the spiracles as in *Macrosila*. Head, thorax, and appendages apparently smooth but faintly wrinkled; abdominal segments wrinkled and punctate evenly and not heavily, their posterior edges on 4th-6th abdominal segments being minutely punctate. Cremaster large, conical, scarcely flattened and with two very minute points upon it. Length 46.5 mm.; breadth 13 mm.

Went under ground September 19.

DOLBA HYLAEUS.

Larval habits, etc. I placed a full grown larva found on Cape Cod early in September under a glass over a plant of sweet fern. The earth was clean, and he soon disappeared; but before doing so he bit off most of the leaves at their base, green and dried alike, and scattered them indiscriminately on the ground below, so that the earth was no longer to be seen, and until the leaves were removed I could not tell whether he was merely hidden beneath them or had gone under ground. No opening in the heap of leaves was discoverable. He had buried himself in the earth to the depth of about an inch in an oblique position, head uppermost.

The faeces of this caterpillar are astonishingly large, forming an irregular cylindrical mass often 12-14 mm. long and 5 mm. broad, of a pitchy black color, and looking like furnace slag, and bearing no such definite markings as are seen in *Macrosila*.

Parasites. While taking notes of the larvae, I was interrupted for a

couple of hours, and was very much surprised on my return to find that one I had been describing just before was now covered with brown worms; no less than eight of them had fastened themselves by threads to the sides of their victim, some on the fifth and some on the eighth and ninth abdominal segments.

They were of a very light brown color, with a slight greenish tinge, having a dorsal row and on either side of it two other rows of small rounded elevations, one upon the anterior edge of each segment in each row; there was also a dark dorsal streak, and here and there dark reddish brown spots, especially upon the dorsal surface and the last three or four segments. The round thoracic spiracles were dark brown. The skin was glistening and very evenly and microscopically reticulate. The head had a faint greenish tinge, and upon each side were two black bent lines like a figure 5 upon its side, while the opposite extremity seems to have a little thicker integument than the rest of the body. Length 7 mm.; breadth 2 mm.

These creatures had wormed their way directly through the body wall of the caterpillar, leaving little brown pits in various parts of the body to mark their exit; but there seemed to be no wound as there certainly was no loss of any fluid; why is there none, and why do all the worms come out together? The caterpillar, on the under side of a leaf, remained motionless, looking very slender and flabby, and acting in a very dumpish manner.

As for the worms, they immediately began spinning their cocoons where they were, and when one was torn vio-

lently away, the maker at once began a new cocoon, constructing one-half at a time, namely the half opposed to its own ventral surface, and when this was completed, it turned about and made the other half. When all were made, the cocoons were seen to lie in clusters, some horizontal but most perpendicular to the back of the caterpillar; they were made of a very fine glistening silk, and when completed were about 4.8 mm. long by half as broad. It took one of them a little more than half an hour to completely envelope itself with silk, though much longer to complete the cocoon. These when finished much resemble the buds of *Comptonia*, being of a light chocolate brown color, roughly ribbed longitudinally about a dozen times, the ends smooth; they are loosely attached to the caterpillar. In escaping from their cocoon, the enclosed Hymenopteron bites off the top of the cocoon in an irregular manner. All that I had escaped me, and some came out at a time when others of the same lot still remained as larvae inside their cocoons.

The caterpillars may be found in nearly every stage throughout the month of August in eastern Massachusetts.

Chrysalis. Uniform shining mahogany in color, with the wings lacking polish.

The whole of the thorax and appendages are minutely wrinkled and all the abdominal segments are rather minutely punctured and also wrinkled; the wings cover the fourth abdominal segment; the tongue case is very short; the cremaster is long, slender, conical, straight, pointed, very rough at the base, smooth toward the tip. Length 38 mm.; breadth 10 mm.; length of tongue 4.25 mm.

HYLOICUS PLEBEIUS.

Chrysalis. Black, the posterior margin of the 4th-6th abdominal segments light brown and minutely striate transversely. Body shaped much as in *Sphinx cinerea*, with the same structure before the spiracles but less prominent; the shoulders prominent. Tongue short, free, regularly curved, rather thickened at the tip and one-third the length of the distance from the tip of the head to the tip of the wings. Metathoracic wings reaching the spiracles of the third abdominal segment. Antennae with a raised point in the centre of each joint. First joint of second pair of legs prominent. Head, thorax, and appendages wrinkled; abdominal segments coarsely wrinkled and deeply punctate. Cremaster like that of *Sphinx cinerea*, excepting that the tip is armed with a bifid prong which is down-curved. Length 44 mm.; breadth 10.5 mm.

One larva went into the ground on September 19, afterwards worked himself halfway and finally wholly out, and changed upon the surface September 25.

LIFE HISTORY OF ORGYIA GULOSA HY. EDW.

BY HARRISON G. DYAR, BOSTON, MASS.

According to my observations, the larvae of this species have four or occasionally five stages for ♂, and five for ♀ moths. This corroborates the published account of *O. leucostigma* by Prof. Riley which I was not able to confirm from New York specimens of that species. Judging by analogy, therefore, *O. gulosa* may elsewhere, or in different seasons have six stages for ♂, and seven for ♀ moths, as I have observed to be the case in all other species of *Orgyia* which I have yet reared. The young larva of *O. gulosa* may readily be distinguished from that of *O. cana*; but not so with the mature larvae. In fact the mature larvae of these two species are hardly distinguishable. The only characters that will serve to separate them are that *O. gulosa* usually has a lateral row of yellow spots which are wanting in *O. cana* and the warts of row v (substigmatal) are brown in *O. gulosa* and red in *O. cana*. But these characters may not always be constant.

ORGYIA GULOSA Hy. Edw.

1881 — Hy. Edw., Papilio, i, 64.

1881 — Bull., Ann. mag. nat. hist. (5) viii, 316.

1882 — Grote, Check list, p. 17, no. 439.

1890 — Packard, 5th rept. U. S. ent. comm. p. 134.

1891 — Smith, List lep., no. 1151.

1892 — Kirby, Cat. Lep. Het., i, 495.

Egg. — Almost spherical, smooth shining white, with a faint brownish spot and ring at the top; diameter 1 mm. Laid in a mass on the cocoon of the female moth and covered with down from her body.

First larval stage. — Head round shining

black; width 0.4 mm. [Probably was really 0.5 mm. The measurement was not verified as I lost the cast head case.] Body pale purplish black, nearly white on the dorsum of joints 3 and 4 and yellow on joint 9; on joints 10 and 11, a large brick red dorsal spot, but no elevations to represent the retractile tubercles which are absent. Warts normal, row i small, row iv represented by small pale dots. The subdorsal warts on joint 2 are large with swollen bases. Each wart bears several black hairs, longer from the sides and extremities.

Second stage. — Head black, a line above the mouth and basal joints of antennae white; width .7 mm. Body black, dorsum of joints 3 and 4 pale yellow, of joint 9 darker yellow; tips of abdominal feet pale orange. Subdorsal warts on joint 2 large, but bearing only ordinary hairs. On joints 3 and 4 a few pale hairs dorsally and on joints 5-7 a few black ones, converging over the dorsal line but not numerous enough to form tufts. Warts all black; retractile tubercles on joints 10 and 11 present, large, orange colored. Side hairs long, black, mixed with paler ones.

Third stage. — Head as before; width 1.2 mm. Body black laterally, the dorsum broadly pale yellow, but transversely streaked with black at the middle of each segment. These bands become broader posteriorly till they cover most of the segment. The yellow is also replaced by black in the segmental incisures and broadly on joints 5-8. Warts blood red, not very bright, rows v and vi and the anterior dorsal ones partly black. Retractable tubercles coral red; cervical shield black. On joint 2 subdorsally and on joint 12 dorsally arise pencils of black plumed hairs* about 1 mm. long. On joint 5 a black

*These hairs differ from the other hairs of *Orgyia* in that the minute branches or barbs, with which they are all furnished, are longer and crowded more closely together near the tips of these hairs, giving them the appearance of being plumed at the end.

dorsal brush-shaped tuft and on joints 6-8 white ones, which arise from the warts of row i and the upper part of row ii. The white ones are less well developed than the black one. Other hair black and white, yellowish dorsally on joints 3 and 4.

Fourth stage.—(All ♀ and some ♂ larvae.) Much as before; width of head 1.8 mm. The brush tufts are larger than before but not full size and they are colored the same. The warts of rows ii and iii are bright blood red, row v brown. (Row i and iv are so small as to be inconspicuous.) The body is colored as before, but the yellow dorsal band is divided by a black dorsal line and there is a broken lateral and substigmatal line. Abdominal feet reddish at tip.

(Most ♂ larvae.) Differ in the greater length of the hair pencils while the four brush tufts are large, nearly alike and all colored of a silvery gray, in some specimens blackish or even black on the crest, but white on the sides, in others nearly all white. In one example, the one on joint 5 was slightly darker than the others. The yellow marks are more reduced than in the ♀ larva, consisting of a subdorsal, lateral and substigmatal row of irregular subquadrate spots. On completion of this stage the ♂ larvae spin their cocoons.

Fifth stage.—(All ♀ and a few ♂.) Head black, the labrum and bases of antennae pale yellow; width 1.7-3.0 mm. Body black, with the dorsum of joints 3 and 4 largely ochreous yellow except a black dorsal line, continued to joint 12 in a row of subdorsal yellow spots, irregularly elongated transversely and connecting over the back posteriorly on the segments; similar lateral and substigmatal rows the latter most continuous. Hair pencils from joints 2 and 12, 2.5-4 mm. long, the one on joint 12 preceded by a tuft of shorter hairs. Brush tufts large, all uniform gray, in some darker on the crest, in others nearly white. The lateral region is irregularly tinged with ashy gray, largely so all over joint 13. Abdominal feet crimson. The warts are arranged as follows. On joint 2, rows i and ii

minute on cervical shield, iii large, bearing the pencil, vi stigmatally; on joints 3 and 4 rows ii-vi, row iv being rudimentary, on joints 5 and 6 rows i-viii, row iv is rudimentary, behind the spiracles and rows vii and viii larger, on the venter; on joints 7-10, rows i-vi, row iv minute; on joint 11 like joint 5; on joint 12 rows i-v, vii and viii, row iv being minute and vi absent; on joint 13, rows ii, iii, v, vii and viii. Warts i-iii are bright red, but row i is so small as hardly to be seen; row iv is reduced to whitish spots bearing a few very inconspicuous hairs and row v is brown, while row vi is whitish with minute black tubercles, but is inconspicuous on account of its subventral position, though the warts are large. This is the last stage for ♀ larvae.

Cocoon.—Elliptical, thin but opaque, composed of silk and the larval hairs, one end being left partially open to facilitate the ejection of the cast skin.

♂ pupa.—Cylindrical, rounded and blunt anteriorly; abdomen tapering; cases prominent; cremaster long, but thick, terminating in hooks which adhere to the silk of the cocoon. Length 12 mm., width 4 mm. Color black, shiny, except the back which is brownish and the abdominal incisures which are nearly white. There are several rows of flat granular areas which represent the larval warts and bear a few hairs, and three dorsal tufts of short dense white hairs* on the second to fourth abdominal segments, representing the brush tufts. Duration of this stage 18 days.

♀ pupa.—Abdomen large, thorax small, cases moderately large but slight. Color dark brown, nearly black on the back, ornamented as the ♂ pupa, but the dorsal structures representing the larval tufts are on

* Under the microscope these structures present a curious appearance. They are not a tuft of hairs, but an irregular yellowish gelatinous mass, of a square shape but irregular surface above, divided to the body on the dorsal line and seeming to contain a few hairs, besides several long ones similar to those over the rest of the surface.

abdominal joints 1-3, with slight ones on joint 4. Length 17 mm.; greatest width 6.5 mm. Duration of this stage 9 days.

Food plant.—Live oak (*Quercus agrifolia*).

♂ moth.—Variable in markings. An average specimen was marked as follows. Primaries brownish gray, whitish scales largely predominating over a ground of black and brown scales; a black basal line, not reaching costa or internal margin and a brownish patch outside this, covering the lower half of the wing before the t. a. line and narrowly separated from the t. a. line by pale gray. Transverse anterior line broad, brown with black scales, especially near the costa, nearly straight, gently angulated at median vein; a reniform discal spot, outlined in brown, filled in with a white shade and narrowly bordered with whitish. Median space pale gray, especially costally, darker outside the reniform spot; veins slightly lined in black. Transverse posterior line black, starting from costa above reniform spot, passing outward and around the spot, thence inwardly curved, slightly dentate outwardly on all the veins and reaching internal margin parallel to t. a. line. On the costa beyond t. p. line, a black patch, from which proceeds the rusty brown subterminal line, following a course parallel to the t. p. line and strongly marked below vein 2 by a white crescentic mark, which is produced toward the anal angle (on one wing) giving it the shape of a comma. A brown terminal line, heavier and marked with black opposite the crescent. Fringes blackish interrupted with paler.

Secondaries chestnut brown, shaded with black, quite heavily all around the outer margin and apex. Below, chestnut brown; the costa of fore wings gray and an exterior blackish brown line on the costal half of all four wings. Expanse, 27 mm. (1.1 inch).

♀ moth.—Head and thorax small, legs slender, antennae small, shortly bipectinate; wings fully 5 mm. long, narrow, bent, clothed with sordid white hairs, mixed with a few black scales. Abdomen very large, robust,

covered abundantly with pale cinereous down beneath. Back thinly clothed with sordid white down, the dorsum of the body showing through in a broad dark cinereous band on both thorax and abdomen. Width of thorax 3 mm.; length 2 mm.; width of abdomen 9.5 mm.; length 15 mm.

Habitat.—Coast region of California. Recorded from Contra Costa Co., (Edwards), Alameda Co. (Behr), San Mateo Co., Santa Cruz Co., and Monterey Co., Cal.

The moths above described agree so well with Mr. Edwards' characterization of *Orgyia vetusta* Bd. that, had it not been for the food plant of the larva, I should have had no hesitation in referring them to that species. On the other hand, I have received from Mr. L. E. Ricksecker, under the name of *O. vetusta*, moths which exactly correspond with Mr. Edwards' description of *O. gulosa*. It is evident, therefore, that Mr. Edwards has confounded the two forms and placed the larvae wrongly. His descriptions of the mature forms of *O. vetusta* and *O. gulosa* in Papilio (i, 60-62) should be transposed, while the characterizations of the larvae are correct. I have concluded to preserve the determinations of the larvae as made by Mr. Edwards rather than those of the moths because, in the larval state, they are the more easily separated, especially in relation to their food plants, and because this determination is the one generally accepted by Californian collectors.

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BY SAMUEL HENSHAW.

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Cioidae, 1883, pt. 24, p. 218-224; 1886, pt. 47, p. 354-360.	6	24

Species of the following genera are figured:—

Lycidae.—*Caenia*, 1. **Calleros*, 4. **Calocladon*, 2, 4, 11. **Calolycus*, 4. *Calopteron*, 1, 2, 4, 11. **Linoptes*, 11. *Lucaina*, 12. **Lycinella*, 11. *Lycostomus*, 1, 2, 11. *Lycus*, 1. *Lygistopterus*, 1, 2, 11. *Plateros*, 1, 2, 11.

Lamproidea.—*Aethra*, 3, 11. *Aspidosoma*, 3, 4, 12. *Cladodes*, 3. *Cratomorphus*, 4, 11, 12. **Drilolampadius*, 3, 11. *Hyas*, 3. *Lamprocera*, 3, 11. *Lucidota*, 3, 4, 11. *Megalophthalmus*, 11. *Phaenolis*, 3. *Phengodes*, 3, 5. *Photinus*, 3, 4, 12. *Photuris*, 3, 4, 12. *Pyrectomena*, 3, 4.

Telephoridae.—*Belotus*, 6. *Chauliognathus*, 5, 6, 12. **Daiphron*, 5. **Discodon*, 5, 6. *Lobetis*, 6. *Malthinus*, 6. **Maronius*, 6. 12. *Silis*, 5, 6, 12. **Thinalmus*, 6. *Trypherus*, 6.

Lymexylonidae.—*Atractocerus*, 7. **Euryopa*, 6. *Melittomma*, 7. **Ptorthodius*, 6.

Melyridae.—*Anthocomus*, 6, 7. **Antioxon*, 13. *Astylus*, 7, 12. *Attalus*, 13. *Collops*, 6, 13. **Cymbolus*, 13. **Dromanthus*, 7, 13. *Ebaeus*, 7. *Lemphus*, 13. *Llistrus*, 13.

Cleridae.—*Aulicus*, 8. **Blaxima*, 8. *Chariessa*, 12. *Clerus*, 8, 12. *Colyphus*, 7,

8, 12, 13. *Cymatodera*, 7, 13. *Epiphloeus*, 8, 12. *Hydnocera*, 9, 13. *Ichnea*, 9, 10, 12. *Lebasiella*, 9. *Orthopleura*, 9. *Pelonium*, 9, 12. *Phonius*, 7. *Platynoptera*, 9. *Poecilochroa*, 13. *Priocera*, 7, 13. *Pyticera*, 9. *Sallaea*, 8. *Tillus*, 9, 13.

Ptinidae.—*Anobium*, 13. *Cathorama*, 10. *Dorcatoma*, 10. **Lioolius*, 10. **Micranobium*, 10. *Mirosternus*, 13. **Pitnus*, 10. **Priotoma*, 10. *Ptinus*, 10. **Thaptor*, 10. *Trichodesma*, 10. *Trigonogenius*, 10, 13.

Bostrychidae.—*Bostrychus*, 10. *Dinoderus*, 13. *Polycanon*, 10. *Tetrapriocera*, 10. *Xylopertha*, 10.

Cioidae.—*Ceracis*, 10. *Cis*, 10, 13. *Macrocis*, 10. *Xylographus*, 13.

The figure following the name of the genus denotes the number of the plate; new genera are marked (*).

VANESSA MILBERTI, A CORRECTION.—In the current volume of *Psyche*, p. 10, I notice reference to a specimen of this butterfly having been caught at Polegate, Sussex, in England. At the time I questioned the authenticity of the specimen, and at the meeting following that at which it was exhibited, enough information had been obtained to prove that it was not taken in England and had been palmed off as a variety of *V. urticae* on a gentleman who gave rather high prices for varieties of British Lepidoptera.
J. W. Tutt.

ENTOMOLOGICAL NOTES.—The twelfth part of Kolbe's Introduction deals with the digestive tract and its appendages and the secretory organs, apparently completing the study of the internal structure of insects, though the outline of the plan of the work announced in the first part has not been strictly followed. The special bibliographies to each section are, as heretofore, important accessories to the work, but do not appear always to have been compiled with sufficient care, many minor references being given which hardly deserve mention in a selected series,

while some of much greater significance are omitted.

In an interesting paper on *Acronycta*, which has been for some time running through the pages of the *Entomologists' Record*, Dr. T. A. Chapman states that in its two last stages the larva of *Cuspidia alni* emits a strong odor when irritated. "The odor is suggestive of an escape of ordinary illuminating coal gas. A friend of chemical and engineering experience to whom I submitted some examples says the odor is that of carburetted hydrogen. The scent is emitted most strongly when the larva is ready to search for a place to pupate in. It is so strong that I have several times wondered whether there was not an escape of gas in the room in which the larvae were. It is perhaps proper to suggest that this odor is protective, and in this sense associated with the brilliant 'warning' color and conspicuous station (on the middle of the upper surface of a leaf) of the larva."

H. F. Wickham in a recent bulletin of the University of Iowa gives a detailed account of his search for Coleoptera in southern Alaska.

A paper on the Gryllidae of Indiana just published by W. S. Blatchley (*Proc. Ind. acad. sc.*, 1891), enumerates sixteen species, belonging to the genera *Tridactylus* (1), *Gryllotalpa* (2), *Gryllus* (3), *Nemobius* (3), *Anaxiphus* (1), *Phylloscirtus* (1), *Orocharis* (1), *Apithes* (1) and *Oecanthus* (3).

Bolivar has recently published in the *Annales of the French entomological society* a detailed account of a new genus of purblind

cockroaches (*Nocticola*) from caverns in the island of Luzon, one of the Philippines. Its structure is so remarkable that he believes it should form a tribe apart among cockroaches. The eyes consist of a few clustered ocelli. Two species were found.

In an abstract of a paper on the Descent of the Lepidoptera, published in the *Proceedings of the American association for the advancement of science*, Prof. J. H. Comstock proposes their division into two great groups, the *Frenatae* and *Jugatae*, according as the line of development has been toward the production of a frenulum connecting fore and hind wings during flight to insure their synchronous action, or of a so-called jugum, a special lobe of the fore wings answering the same purpose. Details are reserved for the final paper.

Rühl has begun the publication of an extended work entitled *Die palaearktischen grossschmetterlinge und ihr naturgeschichte*, to be completed in seventy-five parts. The first (double) part has been issued.

A profusely illustrated work of unusual extent on the genus *Ornithoptera* by R. H. F. Rippon is publishing in England. Five of the twenty parts are already issued.

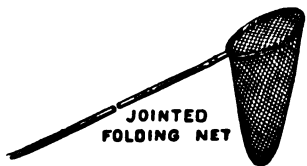
The last number of *Psyche* (203) was issued March 6th, delayed for the plate by a mistake of the printer. All preceding numbers of the current volume have been issued on the last day of the month preceding that for which they were issued; except that when that day fell on Sunday, they were issued one day earlier.

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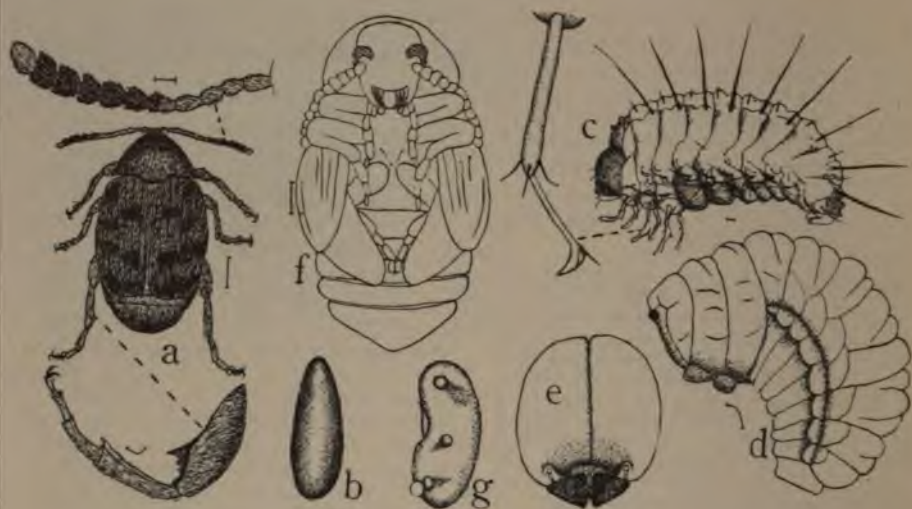


Fig. 1

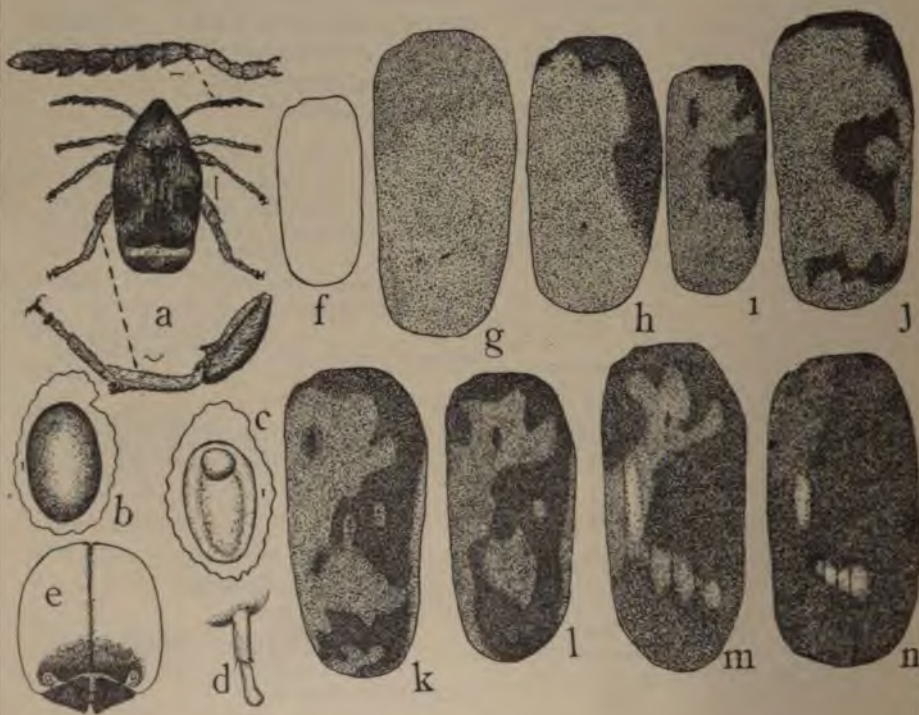


Fig. 2

PSYCHE.

NOTES FROM THE CORNELL INSECTARY.

III.—SOME OBSERVATIONS UPON TWO SPECIES OF BRUCHUS.

BY M. V. SLINGERLAND, CORNELL UNIVERSITY, ITHACA, N. Y.

BRUCHUS OBTECTUS Say.

Although this cosmopolitan insect has been known in this country for over sixty years, and has been recognized as a common and destructive pest for more than a quarter of a century, still it is only within the past year that several interesting phases of its life history have been discovered. During the past two years not less than forty pages of our entomological reports and magazines have been devoted to discussing this pest. And even now there is need of a further study of the species. For instance, we know but little of its habits in the field and hence are not able to suggest any treatment for preventing its ravages until after the deadly work of the larva has begun in the seed.

The name of this insect has been in an unsettled condition for many years, but *obtectus* Say apparently has priority and is now generally adopted. In 1879 M. Maurice Girard (Jour. soc. centr. hort. France, pp. 95-99) said that "several entomologists believe that it has been described under different

names which come under the synonymy of *B. obtectus* Say. It is the *B. irresectus* Schönherr." Dr. Riley has tried for many years to establish his name *fabae*, but has recently (Ins. life, v, 27, 1892) reached a similar conclusion as M. Girard, placing *irresectus*, *fabae*, and other names under the synonymy of *obtectus* Say. Dr. Horn writes me recently that Dr. Riley is probably correct in his change of the name *obsoletus* to *obtectus*.

Previous to June, 1892, I had supposed, and it had always been so recorded, that the beetles laid their eggs upon the outside of the bean-pod, the young larva hatching therefrom boring through the pod and entering the seed. In May, 1892, I confined several beetles in cages containing growing bean plants. The beetles fed upon the surfaces of the leaves until the pods were nearly full grown but still green. I frequently saw beetles at work gnawing a narrow slit in the ventral suture of the pod, and trying it from time to time with their ovipositor; several beetles would work on the same slit, one driving another away and

continuing the work itself. The slits were about 1 mm. in length and were always in the ventral suture, sometimes almost at the point of attachment of the seed. May 23, I found a cluster of eggs in a cavity at one end of a pod, and later two or three eggs were laid upon the outside of the pod, but these were soon knocked off by the beetles themselves in running about. June 8 the eggs in the cavity hatched. It was not until June 18, however, that I discovered the normal nidus of the eggs of *obtectus*. Upon opening some of the pods I was surprised to find clusters of eggs within the pods attached to the ventral suture at the point where I had seen the narrow slit being made by the beetles. The slits do not close up and disappear but the tissues turn dark and the place is thus readily seen in green and even in ripper pods.

On August 15 I presented these facts before the Association of economic entomologists at Rochester (Ins. life, v, 86). Two days later before the Entomological club of the A. A. A. S. (Ins. life, v, 31), Dr. Riley reported similar observations upon the oviposition of the bean weevil in his garden at Washington, thus confirming my laboratory experiments. It seems probable, however, that Dr. Riley's observations were made later than May or June, for in the August number of the Canadian entomologist, p. 186 he says: "The eggs are primarily laid upon the bean-pod in the field, but chiefly, if not entirely, on those which are already mature and ripening, and the larvae enter the same very much as does the pea weevil."

The eggs (plate 16, fig. 1, *b*) are about .75 mm. in length and .3 mm. in diameter at the widest part; the color is white and the surface finely granulate.

In 1879, Dr. Riley discovered the important fact that the insects continue to breed for many generations in stored beans. Although this very important fact was published in a newspaper in 1882, it did not become known to most entomologists until Dr. Lintner recorded similar observations in his seventh report for 1890. During the past year I have bred several generations of the beetles in the dry seeds. I find that even in the slightly varying temperature of an office, the season notably affects their development. When the eggs were laid in March adults issued in about eighty days, while in August beetles emerged from beans upon which eggs had been laid only thirty days before. The egg and pupal stages are of about the same length while the larval stage occupies about twice as many days as either.

Among dry beans the eggs are laid on the seeds but are so slightly attached that they are easily dislodged if the seeds are disturbed. The egg shell is, however, very strong and seldom broken by the movement of the beans. As Dr. Riley has shown (Ins. life, iv, 301) the newly hatched larvae (fig. 1, *c*, adapted from Riley's figure) present several interesting features not found in its further stages. Its long slender legs enable it to move quite readily over the beans until it finds a suitable place, when it bores a minute round hole through the shell and enters the seed.

Several larvae sometimes enter the seed through the same hole. At the first moult this post-embryonic larva loses its legs, hairs, and thoracic shield, and takes on the characters of the mature larva shown at figure 1, *d*. Figure 1, *c*, shows the head of a nearly full grown larva in front greatly enlarged; only the cephalic border of the front is brown, thus giving us a character which will enable us to readily separate the larva of *obtectus* in any stage after the first moult from those of *quadrимaculatus* shown at fig. 2, *e*.

The pupa is represented much enlarged at *f* (adapted from Marlatt). At *g* is represented a bean natural size from which beetles have escaped. Figure 1, *a* shows the adult; the much enlarged antenna and hind leg bring out the characteristics of these appendages. The beetles vary as much in size as do those of *quadrимaculatus*, but the markings of *obtectus* are quite constant.

After breeding several generations of *obtectus* among dry beans, I extended my experiments to other seeds and found that the beetles oviposited readily upon the seeds of our common pea, on corn, on buckwheat, on the large European bean, on lentils, on chick peas, and on the seeds of *Lathyrus sativus*. I have reared the beetles from all of the above seeds except the corn and buckwheat. Larvae are at work in the buckwheat at the present time; and although the larvae entered the corn kernels readily, they seemed to be unable to work well in the much harder interior of the kernel and all died shortly after the first moult.

BRUCHUS QUADRIMACULATUS Fabr.

In "Insect life," v, 32 and 165, Dr. Riley says that in January, 1885 the entomological department at Washington "received *B. quadrимaculatus* Fabr. swarming in what are called 'black-eyed table-beans' from Texas that were exhibited at the Atlanta Cotton exposition. In oviposition in the stored beans this species differs from the common bean weevil in that it deposits its eggs in the beans. Also bred from cow peas (*Dolichos* sp.) from Texas." This seems to be the extent of our recorded knowledge of the habits and life history of this *Bruchus*.

Nov. 18, 1892, Crosman Bros., seedsmen at Rochester, N. Y., sent me a package of peas returned to them from the south which was swarming with weevils. Dr. Horn identified them as *B. quadrимaculatus* Fabr. as recognized by him in his paper of 1873 (Trans. Am. ent. soc., iv, 318). I notice that F. Baudi (Deutsch. ent. zeit., xxxi, p. 36, 1887) considers *quadrимaculatus* a variety of *ornatus* Bohm.

Dr. Horn records the species from the West India islands and the southern states. Nov. 28, I received two more packages of infested peas from Crosman Bros. These had been returned to them from Texas. They have had beans returned to them from the south infested in the same manner.

The beetles were found to vary greatly in size and markings. Pl. 16, fig. 2, *a* represents the beetle; an antenna and a hind leg have been much more enlarged to bring out the characteristics of those

appendages. Fig. 2, *f* to *n* inclusive represent the right wing cover, showing the great variation in size (*f* and *g*) and in coloration (*g* to *n* inclusive). The wing covers from which *f* and *g* were drawn measure 1.2 mm. and 2 mm. respectively, so that the smallest beetles are scarcely more than one-half as large as the largest. The wing covers were all drawn with a camera lucida using the same power of the microscope in each case. No attempt was made to represent the pubescence or striae. I simply desired to bring out the gradual change from a wing cover which is of a plain rufous color as at *g* to one which has the rufous color almost entirely replaced by black with small whitish spots as at *n*. A longer series might have been taken in which the encroachment of the black upon the rufous would have been more gradual, but the eight forms shown will serve the purpose. In fact, every gradation exists in nature between *g* and *n*. Forms similar to *l* and *m* are the most numerous.

Soon after receiving the beetles I began experiments to study their habits and life history. Many beetles were confined among dry peas, beans, and corn. Egg laying soon began on all the seeds. The egg, figure 2, *b*, is oval in shape with flattened base, and is of a bright shining lemon yellow color. It is .6 mm. in length, .4 mm. wide, and .2 mm. thick. Each egg is firmly glued to the outside of the seed (not deposited in the seed as stated in "Insect life") by a thin sheet of transparent substance which extends beyond the egg as shown in the figure. Sometimes fif-

teen or twenty eggs are laid on a single seed, and I have seen a pea from which as many beetles have emerged.

The eggs hatched at this season in from thirteen to twenty days. Several days before hatching the brown heads of the larva can be distinctly seen through the shell, and the whole egg assumes an opaque creamish white color. In escaping from the egg, the larva invariably eats a round hole through one end of the shell where it is in contact with the seed, leaving the visible portion of the shell intact. Figure 2, *c* represents the basal aspect of an egg, showing the manner of escape of the larva. The larvae bore directly from the egg into the seed.

The newly hatched larva resembles somewhat that of *obtectus* shown in fig. 1, *c*, but more closely that of *pisi* figured in "Insect life," v, 205. It differs in the form of its thoracic armature from either, and its legs (fig. 2, *d*) are one-third shorter than those of *obtectus* and resemble those of *pisi* in form. Soon after entering the seed the larvae moult and lose their legs, hairs, and thoracic shield. When mature the larvae are very similar to those of *obtectus* (fig. 1, *d*) in size, shape, and color. Larvae in all stages after the first may be easily separated from those of *obtectus*, however, by a glance at the cephalic margin of the front of the head. The front is of a dark brown color for a considerable distance caudad as shown at *e*, fig. 2 (compare fig. 1, *c* of *obtectus*). Larvae are at present feeding in the seeds of peas, corn, and beans.

In December, 1892, I confined sev-

eral beetles in a cage containing growing peas in which the seeds were about one half grown. Dec. 10, several eggs were laid on the outside of one pod in the same manner as upon the dry seeds. No eggs were laid upon any other pods although there were several in the cage; and as time passed and the eggs that were laid did not hatch, I began to think that they must have been unfertilized. But as they held their shape and color I left them, and how wonderful has been the result! The pod ripened, turned yellow, and the vine was nearly killed by plant-lice and mealy-bugs. Finally, in the latter part of January, 1893, I picked the pod and placed it in a box to wait events. After it had been in the box for about a week, I examined it and what was my surprise to find that the brown heads of the larvae were plainly visible through the shells of several eggs. The eggs were hatching! The pod and its seeds were quite hard and nearly ripened. Fifty days had elapsed since these eggs were laid; and we have seen that ordinarily on dry seeds the eggs hatch in less than twenty days.

What unseen hand was it that held in abeyance the development of the embryo in the egg until the pea had reached the ripening stage—the only stage

when it seems to be fit for the food of the larva? How interesting and wonderful are Nature's ways as revealed in the lives of some of the tiniest of her creatures!

EXPLANATION OF PLATE 16.

Fig. 1.—*Bruchus obtectus* Say.

- a*, Beetle, enlarged; antenna and leg still more enlarged. (Original.)
- b*, Egg, greatly enlarged. (Original.)
- c*, First larval stage, much enlarged; with leg still more enlarged. (Adapted from Riley.)
- d*, Mature larva, enlarged. (Adapted from Marlatt.)
- e*, Front view of head of mature larva, greatly enlarged. (Original.)
- f*, Pupa, enlarged. (Adapted from Marlatt.)
- g*, Infested bean, natural size. (Original.)

Fig. 2.—*Bruchus quadrimaculatus* Fabr.

- a*, Beetle, enlarged; antenna and leg still more enlarged. (Original.)
- b*, Egg, greatly enlarged. (Original.)
- c*, Basal aspect of egg, greatly enlarged. (Original.)
- d*, Leg of post-embryonic larva, greatly enlarged. (Original.)
- e*, Front view of head of mature larva, greatly enlarged. (Original.)
- f* and *g*, Right wing covers of beetle, showing the variation in size of the adult. (Original.)
- g* to *s* inclusive, Right wing covers enlarged, showing variation and gradation in coloration. (Original.)

HYMENOPTERA OF MADAGASCAR.—A notable contribution to entomological literature has just reached this country in the volume treating of the Hymenoptera, forming a part of Granddler's immense work on the physical and natural history of Madagascar, of

which it forms vol. xx. The first part is contributed by Dr. H. de Saussure and makes a quarto volume of more than 600 pp. and 27 exquisitely finished plates; the second by Dr. A. Forel on the ants alone, a volume of about 250 pp. and 7 plates.

AN UNDESCRIBED SPECIES OF VESPA.

BY J. W. SHIPP.

Assistant in the Entomological Department Oxford University Museum.

Having lately been occupied in arranging the wasps contained in the Hope Saunders and Smith's collection I have come across a curious species which has not been mentioned by either Saussure or McFarland, so I venture to describe it here as a new species in honor of Professor Westwood through whose kindness I am able to devote my time to the study of entomology.

This is the only true *Vespa* which I know whose colors are bright dark red and black, and although it somewhat resembles *V. sylvestris* in general facies, it differs essentially from it both in color and the style of markings. It should be placed in the second division of the genus, viz., that in which the eyes extend to the base of the mandibles.

Vespa westwoodii Shipp. Black. Head; mandibles with the exception of teeth, a trape-

zoidal spot above clypeus, clypeus with the exception of a broad longitudinal mark, widening at apex, the sinus of the eyes, a spot close to mandibles on the cheeks, and another longer one above, behind the eyes, red; antennae dull black, a line on the margin of the mesothorax at the sides of prothorax, tegulae, two spots, one on each side of scutellum, two on the post-scutellum and a spot under the anterior wings, red. Abdomen black, first segment with a broad, red apical band, narrowing in centre; second with a broadish red band irregular, widening greatly at the sides, giving the idea of three spots run together; apical segment red with a blackish reflection, bands continued underneath; coxae and trochanters all black, femora black, knees red, tibiae red with a black patch in the centre of the inner margin; tarsi red with a golden pubescence, wings with a slight yellow tint, larger nervures with a decided reddish tint. Eyes extending to base of mandible.

Hab. N. Amer. Bor. Type in Ox. Univ. Museum.

BRIEF NOTES ON TWO JAMAICA
PAPILIONIDAE.

BY T. D. A. COCKERELL.

SYNCHLOE JOPPA.—July 14, 1892, I saw a female ovipositing on a sweet scented sticky Cleome, having a hairy stem, the leaf with five hairy or pubescent leaflets. The egg was laid on the under side of the leaf near the tip. Egg about 1 mm. high, long, cylindrical, shiny pale yellow, truncate above, with twelve strong vertical ribs and numerous small weak transverse riblets. It was not attached other than by the secretion of the hairs of the plant; from the abundance of glutinous

hairs on the leaf it would be hard to attach it in any other way.

PAPILIO PELAUS.—Larvae about to pupate found on Prickly Yellow, July 13, 1892. About 4 cm. long, stout, cylindrical, but first and last two body segments smaller. Head shiny brown with a whitish spot on each side of crown anteriorly. Body dark brown. A pair of short subdorsal tubercles on each of the four first body segments those on the first ochreous; side of body with a broad dash of creamy white marbled with gray on 5-7th body segments and some of the same color on sides of 10th and 11th segments. Abdominal legs pale gray, blotched externally with darker. Thoracic legs brown.

(Continued from page 434.)

laterally broad, subquadrate, densely clothed with hair; the third joint minute and almost lost in the hairy vestiture of the second joint. Antennae moderately long, heavily pectinated, with the setae appressed and almost uniform in length from the base to just before the tip, where they rapidly shorten. The antennae are in all the dried specimens before me curved downward at the tips. The patagia are relatively long, covering the insertions of both the primaries and secondaries. The abdomen is produced one-fourth of its length beyond the posterior margin of the secondaries, and on the dorsal line back of the thorax has a large and very prominent cluster of upright scales, giving the appearance of a small hump. The legs are moderately hairy; the third pair quite long with the tibiae swollen at the end and armed at the extremity and beyond the middle with double spurs. The primaries are subtriangular with the costa moderately convex, the outer margin rounded, the inner margin slightly convex. The secondaries are subpyriform with the costa convex, the outer margin evenly rounded, and the inner margin nearly straight.

♀. The female does not differ materially from the male except that the antennae are less heavily pectinated, the body stouter, and the wings relatively broader.

The prevailing colors are brownish and greenish-brown, and the moths are of moderate size, averaging less than two inches in expanse. The type of the genus is *N. nubifuga*, Holl.

99. *N. nubifuga*, sp. nov. ♂. Palpi, antennae, front, collar, and upper side of thorax dark brown. The abdomen above slightly paler, having the dorsal cluster of scales very dark brown. The under side of the thorax and abdomen is brown, paler than the upper surface. Legs concolorous with the tarsi ringed with dark brown. The

primaries are rich brown with obscure grayish transverse lines along the costa; a velvety brown spot near the base; a very large velvety brown spot beyond this on the inner margin, followed by a series of similar velvety markings disposed as a submarginal series, most prominent below the apex at the end of the third median and near the outer angle. The velvety spot near the outer angle is sometimes accentuated by a small silvery dot on its outer margin. The posterior wings above are uniformly wood-brown with the fringes checkered with darker brown. On the under side, the primaries and secondaries are pale wood-brown, the primaries clouded with fuliginous in the region of the cell and traversed by an obscure double submarginal band. The secondaries have a large dark brown discal dot, a transverse median and an angulated submarginal transverse line. The fringes on the lower side are conspicuously checkered with dark brown.

♀. The female does not greatly differ from the male except in the size of the antennae but invariably in all specimens before me has the silvery spot near the outer angle of the primaries upon the upper side. Expanse, ♂, 35 to 38 mm.; ♀, 38 mm.

100. *N. delicata*, sp. nov. ♂. Upper side of palpi and front pale brown. Antennae testaceous. Collar and upper side of thorax pale brown. Upper side of abdomen dark brown. Lower side of thorax and abdomen pale brown. Legs concolorous, the tarsi and tibiae ringed with brown. The primaries are warm brown marked by very narrow transverse basal, median, and limbal lines of dark brown, margined on both sides by very fine grayish lines. On the inner margin before the base there is a large dark velvety, subquadrate patch of brown scales, and there is a similar linear patch of like scales below the apex on the outer margin, followed by a very narrow irregular marginal line of similar scales. The fringe is pale brown, checkered with dark brown. The

secondaries are wood-brown with the fringes as on the primaries. The under side of the primaries is very pale wood-brown with the median area fuliginous. The wings are traversed by an obscure submarginal line, beyond which near the apex and the outer angle are obscure brown dots. The secondaries are very pale wood-brown profusely irrorated with brownish scales and marked by a large brown discal dot, subtriangular in form, a brown spot at the outer angle, and obscure transverse limbal and submarginal lines, which widen from near the outer angle toward the anal angle. The fringes are marked as on the primaries.

♀. In the female the dark brown spot on the inner margin of the upper side of the primaries is obsolete, as is also the case now and then with male specimens. Expanse, ♂, 32 mm.; ♀, 36 mm.

101. *N. striata*, sp. nov. ♂. Body and appendages dark brown. The upper side of the abdomen is somewhat blackish. Legs ringed with whitish. The primaries are rich ferruginous, darkest near the base, marked by zigzag white and brown lines traversing the wing. At the end of the cell in the primaries there is an obscure annular mark formed of raised dark brown scales, beyond which is a well defined, transverse limbal line, dark brown, margined on either side by whitish. The margin is defined inwardly by a series of small oval white spots, most distinct near the apex. The fringes are pale brown, broadly checkered with dark brown. The secondaries are uniformly pale wood-brown with the fringes checkered as on the primaries. The under side of the wings is marked very much as in the preceding species. Expanse, 38 mm.

102. *N. obscura*, sp. nov. ♂. Allied in general appearance to the preceding species. Body and legs on the upper side dark brown, on the lower side pale brown inclining to luteous. The legs annulated with dark

brown. The primaries on the upper side are brown marked near the base and along the inner margin by pale yellowish and whitish spots, most conspicuous at the outer angle. A similar series of spots is found near the apex. The wings are traversed by an obscure basal, transverse median, and transverse submarginal line, defined partially by lighter external and internal shades. The secondaries are brown with an obscure discal dot and very obscure transverse median and submarginal lines. The fringes of both wings are pale brown, broadly checkered with dark brown. On the under side both primaries and secondaries are pale brown, inclining to luteous. At the end of the cells of both wings there is an obscure brown annular mark, pupiled with light brown; beyond it a transverse median band succeeded by a series of prominent submarginal spots. The fringes on the under side are conspicuously checkered with dark brown. Expanse, 38 mm.

103. *N. proletaria*, sp. nov. ♂. Palpi brown. Front, collar and anterior edge of patagiae glaucous. The tips of the patagia and the upper side of the abdomen ferruginous. The lower side of the thorax and abdomen obscure luteous. The legs concolorous annulated with brown. The primaries at the base and along the inner margin and upon the outer margin are rich ferruginous. The median area is occupied by a broad patch of lilacine gray, separated from the broad area of the wing toward the base by an irregular line running from before the base on the costa obliquely toward the middle of the inner margin, thence ascending by a very irregular and somewhat broken line toward the apex. In the middle of this lilacine gray spot, at the end of the cell, there is an annular mark composed of raised brown scales. The wings are crossed by a basal, transverse median, and transverse limbal line. These lines are very fine and crenulate. There is also an obscure submarginal line. The fringes are pale brown, checkered with dark

brown. The secondaries are marked above very much as in *N. delicata*. On the under side the markings are very much as in *N. striata*. Expanse, 36 mm.

104. *N. muscosa*, sp. nov. ♂. Palpi and front pale testaceous. Antennae testaceous. Patagia and upper side of thorax greenish-olivaceous. The upper side of the abdomen fawn, dark on the dorsal line. The under side of the thorax and abdomen very pale fawn. Legs concolorous margined with brown and with the tarsi annulated with brown. The primaries are dark olive-green, marked with brownish lines and pale green spots. There is a dark brown basal spot near the costa; beyond this a very irregular double transverse brown line defined externally and internally by pea-green, and interrupted below the cell by a blackish longitudinal ray. At the end of the cell there is an obscure annular mark composed of raised brown scales pupilled with pea-green. Beyond is a geminate curved transverse limbal line, defined externally and internally by pale green shades. The outer member of this geminate line near the inner margin expands into a dark olive-brown spot, accentuated externally by a silvery white mark and succeeded externally by some irregular olive-brown marginal cloudings. There is a regular dark brown marginal line. The fringes are pale fawn broadly checkered with dark brown. The secondaries are uniformly pale fawn. On the under side both the primaries and the secondaries are pale fawn inclining to luteous with the fringes checkered with brown as on the upper side. Expanse, 34 mm.

105. *N. viridis*, sp. nov. ♂. Palpi pale brown on the lower side. Antennae with the culmen testaceous, the setae dark brown. There is a white spot at the base of each of the antennae. The front, collar, and upper side of the thorax are dark olive. The upper side of the abdomen is grayish. The under side of the thorax and abdomen is whitish.

Legs concolorous, margined externally with dark brown. The primaries at the base near the inner margin are whitish; beyond this olive-green, shading gradually toward the middle of the wing into glaucous. There is a discal dot of raised scales at the end of the cell; beyond a very fine transverse median line composed of similar raised scales running at right angles to the inner margin, succeeded by a curved transverse olive band, which unites on the inner margin with the transverse brown line. Beyond this is a very irregular submarginal olive-brown line. The apex is pale fawn and upon the margin there is a series of olive spots, marking the interspaces. The fringes are uniformly olive. The secondaries on the upper side are whitish with the fringes obscurely brown. On the under side both wings are whitish, the costal area of the primaries being clouded with blackish, and the fringes being pale brown. Expanse, 32 mm.

OECURA, Holl.

106. *O. (?) crucifera*, sp. nov. ♂. Antennae testaceous. Palpi, front, collar, and tegulae dark brown. Upper side of thorax and abdomen likewise dark brown. Under side of the thorax and abdomen paler. Legs brown. Tarsi ringed with white. On dorsal line of abdomen, three or four high tufts of dark brown hair. Primaries dark brown with purplish reflections in certain lights. There is a dark brown subbasal fascia, followed by some yellowish scales, succeeded by a curved and angulated geminate submedian transverse line, followed by a subquadrate dark brown patch, extending from the costa across the end of the cell. Beyond this there is a narrow transverse limbal line accentuated on the submedian interspaces by light dots, followed by an exceedingly irregular and heavy submarginal line of dark brown. Near the outer angle there is a series of dots on the interspaces. There is a dark marginal line. The fringes are lilacine, broadly checkered with dark brown. The

disposition of the light spaces just before the apex between the spot at the end of the cell and the submarginal line is such as to rudely indicate the outline of a St. Andrew's cross. In some specimens this is more distinct than in others. The secondaries are uniformly testaceous, the fringes checkered as on the primaries. The under side is obscure testaceous with faint suggestions of discal dots and submarginal lines on both wings. The fringes are as on the upper side.

♀. The female is much larger than the male, and on the under side with the discal dots and transverse lines quite distinct. Expanse, ♂, 40 mm.; ♀, 55 mm.

107. *O. (P) ocellifera*, sp. nov. ♂. Antennae, palpi, front, collar, and upper side of thorax rich brown. Under side of thorax and abdomen lighter. Legs brown, margined internally with lighter. Tarsi blackish. On the dorsal line of the abdomen there are four high tufts of dark brown hair. The primaries are rich brown for one-third of the distance from the base, then bluish gray; this bluish-gray area is separated from the outer half of the wings by a curved white line, running from before the apex on the costa with a semi-circular sweep to the outer angle, defined externally by a narrow brown line, succeeded by a narrow light brown line, the space beyond these lines being of the same color as the base and interrupted by a zigzag limbal and submarginal line of dark brown. The apex is marked by a zigzag white line, shaded internally with darker brown. The fringes are brown, broadly checkered with blackish. The secondaries are uniformly pale brown. The fringes uniformly pale fawn. On the under side, the wings are fawn with the primaries clouded with fuliginous near the base and at the apex, and the secondaries have obscure transverse limbal and submarginal brown lines.

♀. The female is much as the male, but larger. The antennae not quite so heavily pectinated. Expanse, ♂, 30 mm.; ♀, 40 mm.

108. *O. (P) thersites*, sp. nov. ♂. Body uniformly blackish-brown. Primaries obscure brown with blackish shades at the base and beyond the end of the cell. At the end of the cell there is a dark brown spot. There is an irregular submarginal narrow line, and also a dark marginal line. The fringes are pale brown checkered with darker brown. The secondaries are uniformly sooty. The fringes are as on the primaries. The under side of both wings is pale brown clouded with fuliginous in the region of the cell on the primaries. On the secondaries there is an obscure discal dot. Expanse, 38 mm.

NOTE. — I refer these three species to my genus *Oecura* without any knowledge of their larval habits. Structurally they agree thoroughly with *O. goodii*, mihi, save that the tufts of hairs upon the dorsal line of the abdomen are more conspicuous than in that species.

THAMNOCERA,* gen. nov.

Allied to the foregoing genera, from which it is not distinguishable so far as the neurulation is concerned, but from which it is distinguished by the structure of the antennae, which in the male are relatively much longer than in *Oecura* and *Notohyba*, and in the female are not nearly so strongly pectinated, as in those genera, the pectinations being quite minute in the latter sex. Furthermore, the tufts, which appear on the dorsal line of the abdomen in *Notohyba* and *Oecura*, in *Thamnocera* are lacking, or obsolescent. The legs have the tibiae at their extremities evenly enlarged, but not tumid as in *Notohyba*. They are sparsely clothed with hair and are armed as in *Notohyba* with two pairs of spurs upon the hind legs. The primaries are subtriangular, somewhat more elongate than in *Notohyba*, but otherwise very much the same. Type *T. albilinea*, Holl.

* Θάμνος = vepres; Κέρα = cornu.

DESCRIPTION OF THE PUPA OF TOXOPHORA VIRGATA O. S.

BY C. H. TYLER TOWNSEND.

The description given below has been drawn from a pupal skin of *Toxophora virgata* O. S., sent me with the fly for determination by Professor C. P. Gillette, who bred the species at Fort Collins, Colo., from the nest of a wasp belonging to the genus *Odynerus*. Dr. Fr. Brauer, in his work on dipterous larvae (*Denkschr. math.-natur. kais. akad. wissensch.* 1883, bd. xlvii, pp. 27-28), mentions the characters of the pupae of the European *Anthrax flava* L. and *Bombylius major* L., and gives a rather diagrammatic figure of a false pupa of *Argyramoeba tripunctata* Meig. Dr. T. Algernon Chapman gave a detailed description of the pupa of *B. major* five years before (*Ent. mo. mag.* 1878, v. xiv, pp. 198-200); it has been figured by Imhoff (*Isis*, 1834), and later by Westwood (*Intr. class. ins.* v. ii, p. 538). Dr. C. V. Riley has described and figured the pupae of *Systoechus oreas* O. S. and *Triodites mus* O. S. (*Rep. U. S. ent. comm.* ii, pp. 267-269). These, if I am not mistaken, are about the only genera the pupae of which have been described. The following description will therefore be of interest as furnishing the first definition of the pupal characters in the genus *Toxophora*, and also as showing the very material differences in pupal structure between this genus and those that have been previously studied.

It will be noticed that the pupal segment which Dr. Brauer calls the first abdominal, I have termed the scutellar. I used the term merely as a matter of convenience, and before referring to Dr. Brauer's work. It, however, seems preferable to designate this segment by some other name than that used by Brauer, since it does not pertain to any part of the abdomen of the perfect insect, but, dorsally, encloses the scutellum which belongs to the mesothorax. I have therefore adhered to the term scutellar segment, and designate the segments which follow as the 1st to the 8th abdominal, the 8th being also called the anal.

Dr. Chapman must have been in error when he stated (l. c. 200) that no parts of the perfect fly were formed in the cephalic horns. It is very apparent that the first antennal joint of *Toxophora* is encased in the upper pair of horns described below, the second joint being reflexed beneath it, and the peculiar awl-shaped third joint being encased in the spine-shaped posterior process of the lower pair of horns. The upper pair is hollow except the tips, and divided longitudinally by a chitinous septum.

Pupa of *Toxophora virgata* O. S.—Whitish, with more or less of a flavous tinge, especially the sternal portions and wing and leg sheaths; cephalic horns rufous brown, tips nearly black; proboscideal sheath

concolorous with sternum; anal hooks rufous brown; long lateral filamentous hairs of abdominal segments rufous, the scattered hairs in the dorsal rows of spines and on sides of venter pale rufous; dorsal rows of appressed spines rufous, darker on tips of spines; spiracles brownish. Four cephalic horns; the upper pair (antennal cases) soldered together on fully their basal two-thirds, much longer and larger than the lower pair, straight and not hooked, stout at base, corrugated and roughened basally but smooth and polished on terminal portion; the lower pair is very short, widely separated, and springs one on each side from the outer base of the upper pair, being continued posteriorly in a spine-shaped process (sheath of third antennal joint); each horn of the upper pair bears immediately outside its dorsal edge at base a hair arising from an ocellus-like impression, and a similar hair on the outer side less than half way to tip arising from a slight depression of the surface; each horn of the lower pair has a hair arising from the integument just below and inside its base. Sheath of proboscis closely appressed to the sternum, and extending back to a point immediately below base of scutellar segment. Cephalic segment moulded above to the shape of the eyes of the imago, constricted posteriorly at its junction with the thorax, with a short hair on each side at the posterior margin laterally and a little inferiorly. Thorax (the soldered proscutum and meso-scutum minus the scutellum) but little wider than head, constricted anteriorly, bulging laterally behind at wing bases; dorso-pleural region with three weak hairs arranged in a triangle and considerably removed from each other, the upper and lower ones in a perpendicular line and the third posterior to this line and about equally distant from the other two; leg and wing sheaths free, extending under the abdomen, the two posterior leg sheaths extending fully to base of fifth abdominal segment (6th abdominal segment of Brauer), the wing sheaths nearly to middle

of second abdominal segment; scutellar segment with six or seven lateral hairs anteriorly. Abdominal segments 1 to 4 of nearly the same width (the 4th but slightly narrower), and a little wider than scutellar segment; segments 5 to 7 successively narrower, the 7th fully one third the width of basal segments; segments 1 to 7 armed on the dorsum with a median transverse row of closely set perfectly appressed posteriorly directed spines, those in the middle of the rows being a little shorter than those on the sides, each row (except the one on the 7th segment) approximated at its ends to the anterior margin and in its middle to the posterior margin of the segment; these rows of appressed spines are in addition sparsely set with posteriorly directed appressed hairs two or three times the length of the spines, the hairs being longest on the sides; the lateral hairs on scutellar segment and those among the rows of spines on the abdominal segments are microscopically pubescent. Scutellar segment and abdominal segments 1 to 6 furnished on their inferior lateral edge each with three (except 6th segment which has only two) long inferiorly and a little outwardly directed filamentous or thread-like hairs on each side, those on the scutellar segment usually directed straight outward (instead of inferiorly) and curved suddenly forward; these hairs are nearly all much longer than the width of the segments from which they depend, except those on the 6th abdominal segment which are about as long as the width of the segment; those on the first two basal segments are considerably the longest; a few shorter hairs spring from the lateral ventral surfaces of segments 1 to 6; the last are microscopically pubescent, but the long filamentous hairs are only sparsely so on their distal portions. Seventh segment with posteriorly directed appressed hairs on sides, but without hairs or only short weak ones on ventral surface. Anal segment a little more narrowed than 7th, directed somewhat downward as is also the 7th, less dis-

tinctly separated from the seventh than are the other segments from each other, without hairs, but armed with two pairs of terminal hooks; the upper or anterior pair blunt spine-like, approximated and stout at base, somewhat appressed but not terminally recurvate or hooked; the lower or inferior pair more removed, terminally recurved below, sharp claw-shaped, slightly divergent, directed inferiorly; anterior to the latter on ventral surface there is a pair of small tubercles. Ten pairs of stigmata or spiracles, as follows: Prothoracic spiracle on side at anterior margin of prothorax; mesothoracic spiracle on anterior border of wing bases; metathoracic spiracle in the anterior lateral angle of dorsum of scutellar segment; and

an abdominal spiracle in the anterior lateral corner of dorsum of each of the abdominal segments 1 to 6, the 7th segment having a small median lateral one higher up on side of dorsum; the spiracles (except the mesothoracic) appear as a corneous circle marked by radiating lines within, those on the 7th segment showing this structure less distinctly, while the mesothoracic spiracle is indistinct and does not usually reveal this structure at all.

Length, 8.5 mm. (including cephalic horns); width of basal abdominal segments, 2.25 mm.; length of long filament-like hairs of 3d to 5th segments about 3 mm., those of 1st and 2d segments over 4 mm.

THE PRIMITIVE NUMBER OF MALPIGHIAN VESSELS IN INSECTS.—I.

BY WILLIAM MORTON WHEELER, PH.D., CHICAGO, ILL.

Since the days of Schwammerdam anatomists have most naturally evinced far greater interest in the physiology than in the morphology of the Malpighian vessels. Hence we are in possession of a much larger body of facts bearing on the function than on the phylogenetic history of these interesting organs. Their possible relations on the one hand to the tracheæ, which have a somewhat similar origin, and on the other to vermian nephridia, which have a similar function, are still shrouded in the deepest obscurity. Before these fundamental questions can be answered satisfactorily, it will be necessary, I believe, to come to some definite conclusion in regard to several minor questions. Foremost among

these is the question as to the primitive number and arrangement of the organs under consideration.

No fact in insect development is better authenticated than the derivation of the Malpighian vessels. It was Bütschli* who in 1870 first showed that in the bee the paired excretory organs arise as hollow diverticula of the hindgut which itself arises as a more extensive invagination of the ectoderm at the caudal end of the embryo. All succeeding writers have confirmed this observation.

It is worthy of note that there is extensive variation in the time at which the vessels make their appearance in

* Zur entwicklungsgeschichte der biene. Zeitschr. f. wiss. zool. 20. bd. 1870, p. 541.

different insects. In some cases, as in the Coleoptera and Hymenoptera (Doryphora, Chalicodoma), they are budded off from the hind-gut when the latter is still very shallow and the embryo comparatively young. In other cases they arise late in development after the hind-gut has reached a considerable length (Orthoptera: Blatta, Xiphidium, etc). Notwithstanding these variations, the derivation of the hind-gut and its appendages from the ectoderm is so easily ascertained that it cannot escape even a very careless observer.*

The few accounts concerning the origin of the Malpighian vessels in Myriopoda are quite definite. According to Heathcote† in *Julus terrestris* a single pair of vessels is formed as outgrowths from the hind-gut, and Metschnikoff‡ long ago made a similar observation on *Strongylosoma guerini*. Zograff's§ figures show conclusively that the Malpighian vessels of Geophilus form no exception to the general rule. It is, therefore, quite certain that the Myriopoda and Hexapoda, which I propose to unite under

the term EUTRACHEATA, agree in the mode of origin of the excretory organs. These may therefore be regarded as strictly homologous in the two groups.

Far less satisfactory are the accounts concerning the so-called Malpighian vessels of other Arthropods. Among the Crustacea (Amphipoda) two, (or in Melita only one) tubular diverticula of the mid-gut have been called Malpighian vessels, on account of their resemblance in form and function to the excretory organs of the Eutracheata. But there is this great difference: the Crustacean vessels are not derived from the ectoderm but according to Spencer* and Mme. Pereyaslawzewa,† from the entoderm.

Peripatus, I need hardly state, has no Malpighian vessels, the numerous pairs of nephridia subserving the excretory function.

In the Arachnida a pair of branching tubules opening into the mid-gut near its junction with the hind-gut have been called Malpighian vessels. There are, however, reasons for doubting their homology with the urinary organs of insects. Loman‡ believes that they correspond to the mid-gut diverticula of the Arthrostraca and maintains that they do not contain urates. The accounts of their origin in the embryo are con-

* According to Graber (Vergleichende studien, etc. Denkschr. d. k. akad. d. wiss. bd. 56, 1889, p. 25 et seq.), the hind-gut probably arises from the mesentoderm in Musca. This if true would make the Malpighian vessels mesentodermic. I have elsewhere pointed out (Psyche, June 1891, p. 98) what appears to me to be the true explanation of the phenomena observed by Graber.

† The early development of *Julus terrestris*. Quart. Journ. micr. sci., vol. 26, 1886, p. 461.

‡ Embryologie der doppeltfüssigen Myriapoden. Zeitschr. f. wiss. zool. bd. 24, 1874, p. 262.

§ Material k moznania embrionalnawo razvetia *Geophilus ferrugineus* Lk. e *G. proximus* L. K. Trudi zool. mus. Moscow, 1882.

* The urinary organs of Amphipoda. Q. Journ. micr. sc. (2) v. 25, 1885, p. 183-190.

† Etudes sur le développement des Amphipodes. 1. Le développement de *Gammarus poecilurus*, Rhk. Bull. soc. imp. nat. d. Moscou, no. 2 année 1888.

‡ Ueber die morphologische bedeutung der sogenannten Malpighischen gefässe der echten spinnen. Tijdschr. nederl. dierk. 5 deel. 1, 1837.

flicting and somewhat unsatisfactory. In the scorpion according to Laurie* the vessels arise as tubular outgrowths of the mid-gut. Derivation from the ectoderm is in this instance precluded, since the hind-gut, or proctodaeum, does not make its appearance till after the Malpighian vessels have arisen. On the other hand Morin,† Schimke-witch‡ and Locy§ are of the opinion that the vessels in the Araneina are budded off from the distal end of the hind-gut in much the same manner as in insects. The only remaining possibility; viz., the derivation of the Malpighian vessels from the mesoderm is advocated by Kishinouye.||

These wide differences in opinion regarding the origin of the Malpighian vessels in all Arthropods, excepting the Eutracheata, commend us in doubting the homology of the various organs hitherto comprised under the same name. In default of definite proof of entodermic origin in the vessels of Crustacea and Arachnida, the suggestion of a new terminology would, of course, be premature. But even if the organs in question should be ultimately shown to be ectodermal in the lower Arthropods, as well as in Eutracheata, the few conclusions advanced

in the present paper will be in no wise affected thereby, since I do not undertake to establish the ancestral number of Malpighian vessels for the Arthropoda as a class but only for the subordinate group Hexapoda.

Both the peculiar numerical constancy of the Malpighian vessels within limited groups of Insecta, and the great numerical disparity between different groups, could not fail to attract the attention of the entomotomist. Brauer,* especially, has made use of these conditions in his classification of insects as Polynephria and Oligonephria. It was also readily seen that the Malpighian vessels when limited in number are, with very rare exceptions, arranged in pairs. Hence Gegenbaur† and others have drawn the correct inference that the paired arrangement represents a primitive feature. It was furthermore observed that embryos and larvae of polynephric forms have a much smaller number of vessels than the corresponding imagines; the converse being very rarely, if ever the case. When, within more recent years, the great phylogenetic value of the embryonic stages was established, it was readily surmised that the condition of the excretory organs in the embryo might furnish some clue to their ancestral number and arrangement. The interesting facts brought to light by the study of the embryonic excretory system of vertebrates certainly justify

* The embryology of a scorpion (*Euscorpius italicus*). Q. Journ. micr. sc. vol. 31, 1890, p. 128.

† Zur entwicklungsgeschichte der spinnen. Biol. centralbl. bd. 6, 1887.

‡ Etude sur le développement des araignées. Arch. biol. tome 6, 1887.

§ Observations on the development of *Agelena navia*. Bull. mus. comp. zool. vol. 12, no. 3, 1886.

|| On the development of Araneina. Journ. coll. sci. im. univ. Japan, v. 4, pt. 1, 1890.

* Systematisch zoologische studien. Sitz.-ber. math. naturwiss. klasse. k. akad. wiss. 91, bd. 1. abth. Wien. 1885.

† Grundriss der vergesscheinden anatomie. 2. auflage. Leipzig, 1878, p. 292.

us in looking for important revelations in other descendants of annelid-like forms. Taking the embryo as our main guide in determining questions of primitive number and arrangement, we find the possible hypotheses on the Malpighian vessels to be quite limited; since *in no insect embryo have more than three pairs of these vessels been found.*

Gegenbaur* observed the frequent recurrence of the number two (some times expressed only in the common openings of numerous vessels) throughout all the divisions of the Arthropoda. Hence this number, he concludes, may be regarded as primitive. It is obvious that this statement may be correct for the Arthropoda in general and still in no wise conflict with the view that the ancestor of a particular subgroup may have had more than two Malpighian vessels. Thus Protentomon may have had several pairs and these, if ascertainable, might be regarded as constituting the typical number for the Hexapoda. The remote ancestor of Protentomon may have had but a single pair.

Two views have been advanced as to the number of Malpighian vessels in

primitive insects. Paul Mayer,* in his well known treatise, expressed himself very clearly on this subject. After doing full justice to all the facts at his disposal he concludes: "Dass die anzahl der paare bei Protentomon 2 betrug, ist so gut wie sicher." The embryological evidence accumulated in 1876 was perhaps too meagre to lead to any other conclusion.

In two recent papers Cholodkowsky† advances the opinion that the primitive number of Malpighian vessels in insects is two. He bases his conclusions on some very interesting observations, to which I shall have occasion to revert, when I come to consider the Lepidoptera.

My own observations on the embryos and larvæ of several insects, together with the facts recorded by other observers, lead me to the conclusion that the ancestral number of Malpighian vessels in insects was six. In other words, Protentomon was not only hexapodous but also hexanephric.

* Ueber ontogenie und phylogenie der insekten. Jen. zeitschr. naturwiss. 10 bd. 1876, p. 142.

† Sur les vaisseaux de Malpighi chez les lepidopteres. Compt. rendus. tome 98, p. 631-633, 1884. Sur la morphologie de l'appareil urinaire des lepidopteres. Arch. biol. tome 6, fasc. iii, 1887.

BRIEF NOTES.—Thorell has just published a second octavo volume of about 500 pp. on the spiders of Indo-Malesia. It is devoted to the lower groups, and closes with a table of the geographical distribution of the 462 spiders so far known from that region.

Our students of Neuroptera will be grateful to Nathan Banks for his Synopsis, catalogue and bibliography of the neuropteroid insects of temperate North America just

issued in the transactions of the American entomological society. The tables are very simple and brief, perhaps erring in this latter feature.

Interesting recent papers on relationships among butterflies will be found in Spuler's Zur stammgeschichte der Papilioniden (Zool. jahrb., vi. 34 pp., 2 pl.), and Haase's Entwurf eines natürlichen systems der Papilioniden (Bibl. zool., heft. viii, 120 pp., 8 pl.).

* l. c. p. 292.

NOTE ON ATROPHARISTA JURINOIDES TOWNS.

The following notes refer to an article by Dr. Williston in *Psyche*, Vol. 6, p. 409, March, 1893.

In the first place Dr. Williston has not examined the types of this species. The types are in my own collection, with the exception of one ♂ which was sent to the American Entomological Society. I have never identified or seen the specimens in Mr. Aldrich's collection, though I doubt not they are the same.

Upon examining the ♂, I find that the hairs on the eyes are extremely faint, but can be seen on close scrutiny. Upon examining the eyes of the ♀, I also find that, though still more faint, some microscopic hairs can be distinguished on inferior portions. Therefore hairiness of the eyes is not a sexual character here, but only the degree of hairiness is. This is a very frequent sexual character in the Tachinidae, and the ♂ usually, if not always, possesses it in the greater degree.

The eyes, however, of neither sex of this species are hairy enough to be called so, and therefore in my generic description I stated the eyes to be bare (*Trans. Am. ent. soc.* xix, 92-3). Before describing the new genus *Atropharista*, I read in Dr. Williston's description of *Melanophrys* that his genus had the eyes thinly pilose (at least in the ♂), and the third antennal joint 4 or 5 times as long as the second; moreover, the fourth vein was said to have a stump of a vein at bend. *Atropharista jurinoides* has the eyes unnoticeably hairy, the third antennal joint in both ♂ and ♀ hardly longer than the second, while the fourth vein has either no stump whatever at bend, or an extremely short one. I therefore think that I was warranted in not referring the present species to *Melanophrys*.

I should state that I have recently received two ♀ specimens of this species from Mrs. A. T. Slosson, collected at Franconia, New Hampshire. These show, in addition to the silvery stripe from eye to antennae, a detached

silvery marking at lower front corner of eye. Upon examining the South Dakota ♀, I find this silvery marking more faintly represented in it. This is the lowermost portion of the broad silvery marking to be seen in the ♂ of this species. Probably the ♀ of *Melanophrys flavipennis* does not possess this, since its ♂ does not possess the broad silvery marking of the ♂ of the present species.

C. H. Tyler Townsend.

MOULD IN CABINETS.

Get some small, cheap Turkey sponges, as free from large holes as possible, and cut them into cubes of from one half to one inch each. Take some long stout pins, and putting two through one of the cubes of sponge, suspend thus the latter in the drawer so that it touches nothing but the pins. Then get some of Calvert's No. 5 carbolic acid . . . and a glass pipette; lift the carbolic by the pipette, and put as much on the sponge as this will hold without dripping. This will completely prevent the increase of the fungus; and if the carbolic be renewed in two or three months, and if the drawers are pretty tightly closed, will kill what may be therein. The carbolic should not be allowed to get on the insects, but the vapor will be found to help to keep them clean and bright by preventing all forms of decomposition. . . . The tissues of the insects in the drawers become after a time, I believe, slightly carbolized, and then mites and mould will not attack them. I use it in all my boxes and drawers, and consider it essential to the preservation of collections containing very large insects by keeping the atmosphere inside the drawers quite disinfected. (*Ent. Mo. Mag.* April, 1893, p. 93-94.)

D. Sharp.

PROCEEDINGS OF SOCIETIES.

CAMBRIDGE ENTOMOLOGICAL CLUB.

10 February, 1893.—The 176th meeting was held at 156 Brattle St. Mr. S. Henshaw was chosen chairman.

Voted: That Article V of the By-Laws be amended by striking out the words "the members of this committee chosen at large shall audit the accounts of the treasurer," and substituting therefor "the accounts of the treasurer shall be audited by a committee of two appointed at the annual meeting by the chair."

Dr. H. S. Pratt of Cambridge was elected to active membership.

Mr. S. H. Scudder exhibited a male of *Melanoplus atlantis* taken by Mrs. A. T. Slosson on the summit of Mt. Lafayette, N. H., in October, in which the terminal segment of the abdomen was entire and not notched. The nearest approach to this condition which he had been able to find after examining many individuals of this species was in some taken in the Moosehead Lake district of Maine. Like these also it differs from more southern specimens of the same species in that the marginal apophyses of the last dorsal segment are relatively shorter and are gibbous at the base. He also showed specimens of a species of *Metrypa* taken at Capron, Fla., by

Mr. E. A. Schwarz and at Punta Gorda, Charlotte Harbor, in the same state, by Mrs. Slosson. This is the first record of the genus in the United States.

Mr. Scudder further stated that recently, in the course of compiling certain statistics for the U. S. Geological Survey, he had occasion to count the number of drawings of fossil insects which had been made under his direction and found that they exceeded 3500—a larger number, he believed, than had fallen under the study of any one else; of these 1949 (including a number now printing) had already been published on 97 plates, all but 18 of quarto size.

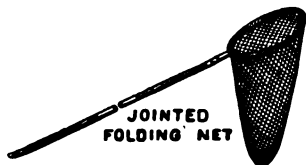
Mr. H. G. Dyar read a paper on the species of *Arctia* occurring at Poughkeepsie, N. Y., and exhibited specimens and drawings.

Mr. A. P. Morse read a description of a new species of *Stenobothrus* and made remarks on the New England species of the genus which were exhibited.

The club then proceeded to examine portions of Mr. Scudder's collection of Orthoptera.

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PSYCHE.

AN UNUSUAL APPEARANCE OF SCHISTOCERCA AMERICANA.

BY W. S. BLATCHLEY, TERRE HAUTE, IND.

About three o'clock in the morning of April 11th, 1893, the city of Terre Haute, Indiana, was visited with a severe storm of rain and wind from the southwest.

A number of buildings were unroofed and many shade and forest trees twisted and broken off.

While on my way to the High School building several persons informed me that they had that morning seen specimens of "gigantic grasshoppers" on the streets but were unable to capture them. About ten o'clock one of my former pupils brought me two living, mature specimens of that large and handsome locust, *Schistocerca americana* Drury, which she had picked up from the sidewalk near her home. I was much surprised to see them as the earliest date at which I had before noted the species in this vicinity was June 27, 1891, when I found them common and freshly moulted in a small prairie east of Terre Haute. I have never seen the young or imago in winter but have taken the latter in numbers as late as November 22nd.

On looking up all references as to their time of appearance in other localities I find nothing definite as to whether the species hibernates as imago or young and but little about its appearance in spring. Dr. Riley gives June 14th as the date of its appearance at St. Louis,* and states† that the average period between hatching and maturity is 70 days. He also states‡ that "Certain large locusts, belonging to the genera *Acridium* and *Oedipoda*, hibernate in the full grown, winged state . . . and that two species which are most often found with the young (of *Melanoplus spretus* Uhler) are the American *Acridium*, (*Acridium americanum* Drury) and the Coral-winged Locust (*Oedipoda phoenicoptera* Germ)." He does not say in so many words that *americana* hibernates in the mature state, though from the context one would infer that he so meant. In this locality the Coral-winged Locust, now known as *Hippis-*

* First Report U. S. entomological commission, 221.

† Loc. cit. 237.

‡ Loc. cit. 236.

cus tuberculatus Beauv., hibernates as a larva and reaches maturity about May 1st.

Dr. Cyrus H. Thomas in 1871 described* a form of *S. americana* under the name of *Acridium ambiguum* and stated that in southern Illinois it always appears in small numbers in April or May while *americana* never appears earlier than the middle of July. In another place† he says of *ambiguum*: "It is this variety which appears occasionally to pass the winter in the perfect state." The specimens in my possession may be his var. *ambiguum* but as far as I can see they do not differ either in structure or color from specimens of the typical *americana* taken in this vicinity in October.

McNeill says of *S. americana*, that its earliest recorded appearance at Rock Island, Illinois, is Sept. 20th‡; while Scudder records its capture at Fort Reed and Jacksonville, Florida, on April 10th.§ This comprises all the infor-

mation at hand as to dates of appearance at other places.

That the species is, to a certain extent, migratory is well known, numerous instances of this habit having been recorded by Riley,* Thomas, and other writers; but these migrations all occurred in late summer or in autumn.

Its unexpected appearance here so early in the season gives rise in my mind to the following questions: Where, if at any place, in the United States does it hibernate as imago? Is it double or treble brooded in such a locality? At what point southwest of Terre Haute, Indiana, does it occur mature as early as April 12th in sufficient abundance that it could be blown in numbers and scattered over the streets of this city? In this locality it is evidently double brooded, the first brood maturing in June or July from eggs hatched in spring, the other maturing in September or October.

HOSTS OF NORTH AMERICAN TACHINIDAE, ETC., I.

BY C. H. TYLER TOWNSEND, LAS CRUCES, N. MEX.

The following twenty-seven species of tachinids, sarcophagids, etc., were all bred by Prof. S. A. Forbes, in Illinois. They were included in a large collection of Muscidae sent to me for determination from the Illinois State

Laboratory of Natural History at Champaign.

1. *Cistogaster immaculata* Mcq.—One bred from *Leucania unipuncta*.

2. *Ocyptera euchenor* Wlk.—One bred from "Acrididae." Also one (smaller specimen) from *Leucania unipuncta*.

* U. S. geol. surv. of Montana, 1871, 447.

† Psyche, VI, 73.

‡ Ninth Rep. st. ent Ill., 1880, 133.

§ Proc. Bost. soc. nat. hist., XIX, 86.

* First Rep. U. S. ent. comm., 449.

3. *Exorista phycitae* Le Baron.—Two specimens bred from *Acrobasis indiginella*.

4. *Exorista hirsuta* O. S.—One from *Botis penitalis*.

5. *Exorista ciliata* Twins.—Six from *Hemaris diffinis*. Two of the specimens have the red on sides of abdomen much like *E. scudderi*, but are apparently greased specimens of *E. ciliata*.

6. *Exorista trivittata* v. d. W.?—One specimen, which may belong to this species, but is too broad-headed to be a typical *Exorista*, was bred from *Apateleta oblineata*.

7. *Masicera archippivora* Riley.—Eleven specimens bred from *Danaus archippus*; and one from *Clisiocampa* sp.

8. *Masicera schizuræ* Twins.—One bred "from pupae of *Euchaetes egle*. Breeding cage, May 4, 1880"; and one "from larva."

9. *Masicera nigrita* Twins.?—Three specimens, which I doubtfully identify as this species, were bred from *Gortyna nitela*. Another specimen was bred from *Gortyna* sp. They all differ from the type in being less narrowed in form.

10. *Masicera eufitchiae* Twins.—Two specimens, a ♂ and a ♀, which I can hardly separate from the type of this species from Colorado, were bred from *Hyphantria textor*. The ♂ is issued July 30, and the ♀ July 31. They seem to be hardly as robust as the type and not quite so bristly, but otherwise I cannot separate them. The ♂ has the sides of abdomen a little reddish,

but the ♀ shows none of this color. The type specimen from Colo. is a ♂, and shows some reddish on sides of abdomen. Another difference to be noted is that the present bred pair shows the segments of the abdomen quite uniformly pollinose posteriorly as well as anteriorly, while the type shows the segments pollinose mainly at base, the rest being quite shining.

11. *Nemoraea hyphantriae* Twins. mss.—Two bred from *Hyphantria textor*.

12. *Nemoraea nigricornis* Twins. mss.—Three bred from *Hyphantria textor*.

13. *Miltogramma argentifrons* Twins.—One bred from *Leucania unipuncta*.

14. *Micropalpus fulgens* Meig.—Two specimens bred from "cutworm."

15. *Phorocera edwardsii* Will.—One bred from "cutworms."

16. *Phorocera comstocki* Will.—One from *Botis penitalis*; and one from *Lophyrus* sp.

17. *Prospheya promiscua* Twins.—One bred "from pupae of *Euchaetes egle*. Breeding cage, May 4, 1880."

18. *Phasioclista metallica* Twins.—One specimen (apical cell closed) bred from *Sphenophorus parvulus*. Another specimen, which does not differ except that it has the apical cell open, was bred from *Leucania unipuncta*.

19. *Macquartia* sp.?—One bred from "coleopterous larvae."

20. *Phrissopoda lamanensis* R. D. Myod. 335. (*Peckia*)?—Desvoidy's description agrees quite well, both in size and color, with three ♂ specimens

bred from *Nephelodes minians*. Two specimens show the whole face and front, even the frontal stripe in some lights, brassy golden; while the other one shows the facial depression and frontal stripe blackish. They might be identified with *Sarc. sarraceniae* Riley, but for the fact that the description and figure of the latter show no bushy hairs on posterior tibiae. This latter character indicates the species as belonging to the genus *Phrissopoda*. It is doubtful whether this is Desvoidy's species, however.

21. *Sarcophaga helici* Twms.—Nine specimens bred from "*Lachnosteria*"; nine from *Pieris rapae*; and two from *Leucania unipuncta*.

22. *Sarcophaga oedipodinis* Twms. mss.—Thirteen specimens, bred from *Heliophila unipuncta* (?), I cannot actually separate from two specimens of above species sent me by Mr. Scudder, and bred from *Dissosteira carolina* captured at Niagara Falls.

23. *Sarcophaga acrididarum* Twms. mss.—One bred from "Acrididae."

24. *Sarcophaga* sp. ♂.—Two from *Leucania unipuncta*. The species may be recognized by the following brief description:

Length, 9-10 mm. Face, sides of face, cheeks, and sides of front silvery whitish or cinereous; frontal stripe, antennae, palpi, and legs black; third antennal joint about twice as long as second. Thorax cinereous, with three black vittae, and a shorter one on each side; abdomen marmorate with silvery, cinereous, and black, three blackish vittae showing moderately distinct in an oblique light; anus fulvous. Marginal macrochaetae on third and fourth segments, less closely

approximated on third segment. Femora ashy below. Venation typical of genus. One specimen, however, has the left apical cross vein bent in at an angle at base, and with a small stump projecting inward from the angle. Both are males, and the front is $\frac{1}{2}$ width of head. Row of small bristles on sides of face below near eye margins well pronounced.

A much smaller ♂ specimen (6 mm.), also bred from *L. unipuncta*, has the anus more broadly fulvous, the face with more of a brassy tinge, the front hardly as wide proportionally. It is perhaps distinct.

25. *Sarcophaga* sp.—One from *Leucania unipuncta*. It may be described as follows:

Length, $5\frac{1}{2}$ mm. With much the facies of *Miltogramma*, but arista plumose on basal half. Wholly of a slightly brassy cinereous. Antennae rufous on second joint and base of third, palpi rufous. Third antennal joint about $1\frac{1}{2}$ times as long as second. Front $\frac{1}{2}$ width of head, frontal vitta $\frac{1}{2}$ width of front. Frontal bristles descending a little below base of antennae, 3 or 4 orbital bristles, a double row of minute bristles on sides of face extending upon sides of front. Vibrissae on oral margin. Thorax brassy cinereous, without distinct vittae. Scutellum with a long apical non-decussate pair of macrochaetae. Abdomen concolorous, only short bristly, anus tipped with fulvous. Venation typical of *Miltogramma* (and *Sarcophaga*). If this species is found to be undescribed, it may be known as *S. leucaniae*.

26. *Ormia* sp? — A ♂ bred from *Crambus*.

27. *Lucilia caesar* L. — Six bred from *Leucania unipuncta*.

Note.—I do not vouch for all of the above flies being true parasites. The hosts as given above are simply taken from the records of breeding sent me with the specimens by Professor Forbes.

(Continued from page 454.)

109. *T. albilinea*, sp. nov. ♂. Palpi, front, collar, and thorax above dark brown. The abdomen plumbeous. Under side of body plumbeous, legs concolorous, tarsi ringed with whitish. Primaries dark fuscous with an obscure discal dot and a straight transverse narrow white line beyond the middle of the wing, running from the costa to the inner margin. Secondaries pale fuscous. Under side pale fuscous, lighter than the upper side of the secondaries.

♀. The female like the male, save that the antennae are very lightly pectinated and the expanse of the wings is greater. Expanse, ♂, 35 mm.; ♀, 43 mm.

110. *T. nubilata*, sp. nov. ♂. Marked like the preceding species, save that instead of a white line traversing the primaries there is a dark brown line, which reappears upon the under side. Expanse, 35 mm.

111. *T. albinotata*, sp. nov. ♂. Antennae testaceous with white spots at the base. Palpi, front, upper side of thorax, and abdomen dark brown. Under side paler brown. Primaries ferruginous clouded with fuscous transverse lines and marked with light bluish-white and white spots disposed in intricate patterns. There is a moderately large oval white dot on the cell beyond the base. Secondaries fuscous with the fringes of both wings very pale brown broadly checked with dark brown. On the under side the wings are luteous clouded with fuliginous in the region of the cell in the primaries, and near the costal margin of the secondaries. Both wings have large well-defined brown discal dots followed by incomplete transverse median, and submarginal bands of dark brown. Expanse, 47 mm.

112. *T. fumosa*, sp. nov. ♀. Body and appendages brownish-fuscous, darker above. Wings obscure brown, traversed by a basal,

transverse median and submarginal line composed of lunulate spots. There is a dark spot at the end of the cell and a smaller one on the cell before the base. On the margin there is a series of brown spots margined internally by brown subhastate markings. Fringes pale brown broadly checked with dark brown. The secondaries are fuscous. Fringes uniformly concolorous. On the under side, the wings are brownish-fuscous. The secondaries have at the end of the cell a large lunulate pale spot bordered by dark brown. These are also marked by an obscure transverse median band of brown. Expanse, 43 mm.

113. *T. pallida*, sp. nov. ♂. Palpi, front collar, tegulae pale greenish-brown. Abdomen slightly darker above. Thorax and abdomen inclining to whitish below. The legs whitish. The primaries are greenish-brown (quite pale), traversed by darker lines with a well defined reniform spot at the end of the cell followed by a waved and angulated double transverse median line. There is an obscure submarginal line and a marginal line which at the inner margin expand into the form of darker spots. The fringes are pale, checked with pale brown. The secondaries are uniformly pale fawn with the fringes lighter, and without markings. On the under side, the wings are of the same color as the fringes of the secondaries, and the only markings are an obscure discal dot and an incomplete transverse median line on the primaries. The fringes below are as on the upper side. Expanse, 43 mm.

114. *T. coeruleifascia*, sp. nov. ♀. Body dark brown, lighter below. The primaries are dark sooty-brown with some obscure transverse markings on the cell and the limbal area. There is a submarginal fascia of bluish-white scales extending from before the apex to the inner margin, most conspicuous and widest on the latter. There is a marginal series of small bluish-white dots on the interspaces. The fringe is obscurely checkered

with pale brown at the end of the nervules. The secondaries are uniformly fuscous. On the under side, the wings are obscure fuscous with very obscure discal dots at the end of the cells followed by obscure and incomplete transverse median and submarginal lines somewhat darker than the ground color. Expanse, 40 mm.

ILEMA, Moore.

115. *I. gonophora*, sp. nov. ♂. Antennae, body, and legs wood-brown. Upper side: Primaries brown, darker on the cell and costa, traversed by a broad transverse limbal line of dark brown, which runs from before the apex, at which point it is widest, to near the middle of the inner margin, whence it is continued inwardly parallel to the inner margin as far as the base. It is defined inwardly by a narrow interrupted series of raised velvety scales, which are very dark brown in color. There is a dark ray of brown raised scales at the base. On the outer margin near the outer angle are some dark brown cloudings accentuated with darker minute patches of raised blackish scales, and a small subtriangular spot lying near the transverse limbal line. There is a marginal series of minute linear patches of raised scales. The fringes are pale brown checked with darker brown. The secondaries are fuscous, darkest on the outer margins. The fringes are pale wood-brown.

Under side: Both wings are pale wood-brown. Both are crossed by incomplete transverse limbal lines. The primaries are heavily clouded with fuliginous on the cell and costa near the base. The secondaries have a distinct discal spot at the end of the cell and a few obscure submarginal spots. Expanse, 33 mm.

116. *I. albibasalis*, sp. nov. ♂. Antennae and upper side of body dark brown; lower side of body and legs paler. Upper side: Primaries reddish-brown with a submarginal

band of darker cloudings and a darkish ray of brown extending from before the base below the cell outwardly to the end of the cell, where it is interrupted by an obscure annular mark of pale brown, and is then continued beyond the cell toward the costa which it reaches about two-thirds of the distance from the base. At the base, there is an oval patch of chalky markings and a series of similar chalky-white markings at the apex. The fringes are pale brown checked with darker brown. The secondaries are uniformly pale fuscous.

Under side: Primaries pale shining testaceous with the cell and the region of the median nervules uniformly clouded with pale fuliginous. There is an incomplete transverse limbal line running from before the apex to about the middle of the wing. The fringes are very dark brown checked by pale testaceous. The secondaries have the ground color as the primaries and a faint annulus at the end of the cell, beyond which are moderately broad parallel irregularly curved transverse median and transverse outer lines of pale fuliginous. ♀. The female is marked much like the male, but the markings are not quite so distinct. Expanse, ♂, 23 mm.; ♀, 30 mm.

117. *I. albosparcata*, sp. nov. ♂. Body above pale reddish-brown; under side of body and legs lighter. Upper side: Primaries dark brown with a blackish annulus at the end of the cell. A broad chalky-white band runs from the lower median nervule diagonally to the apex and is cut into at the end of the cell by the blackish annulus, and also by a dark brown spot lying on the costa before the apex. There are some obscure pale submarginal lines. The secondaries are uniformly pale testaceous. Under side: The wings are marked very much as in the preceding species, save that the white band of the primaries reappears on the under side beyond the end of the cell, where it is crossed by a transverse limbal line. Expanse, 25 mm.

118. *I. apicata*, sp. nov. ♂. Upper side of body dark brown with the collar and patagia pale brown; under side of the abdomen pale luteous; legs pale brown annulated on the tarsi with dark brown. Upper side: Primaries dark brown with a whitish semi-lunate patch on the inner margin near the base. The apex is broadly whitish interrupted on the lower edge of this paler area by a dark brown cloud, which is a continuation of an obscure transverse submarginal line. There is a marginal series of minute whitish spots. The fringes are dark brown checked with paler brown. At the end of the cell is a minute blackish discal dot, margined with pale brown. The secondaries are uniformly pale fuliginous with the margins paler. Under side: The ground color of both wings is very pale wood-brown with the cell and middle area of the primaries heavily clouded with fuliginous. There is a blackish discal dot at the end of the cell of both wings, and both wings are crossed by paler and somewhat obscure transverse median and transverse limbal lines, most distinct upon the secondaries. Expanse, 22 mm.

119. *I. miserata*, sp. nov. ♂. Upper side of body dark brown with the patagia paler; under side of body paler. Upper side: Primaries dark brown clouded with numerous obscure transverse fuliginous striae, the outermost forming a distinct zigzag submarginal series followed by a marginal line of minute linear patches of raised scales. The apical region is much paler, save where crossed by the dark lines, and at the end of the cell extending upwardly to the costa is a suboval whitish area margined by very narrow dark brown lines and intersected by two similar narrow lines about the middle. The secondaries are uniformly grayish with the margins lighter. Under side: The under side of both primaries and secondaries is pale gray with the costal area of the primaries darker, especially toward the apex.

♀. The female is marked like the male,

but is considerably larger and the markings are not quite so distinct. Expanse, ♂, 28 mm.; ♀, 36 mm.

120. *I. circumdata*, sp. nov. ♂. Collar and upper side of thorax pale reddish-brown; upper side of abdomen darker brown; lower side of thorax and abdomen pale brown. Upper side: The upper side of the primaries is dark brown, obscurely spotted and clouded with blackish. The outer margin and the inner margin are broadly pale reddish-brown of the same shade as the upper side of the thorax. There are a few obscure whitish dots near the apex, an obscure submarginal series of minute brown dots, and the fringes are dark brown checked with pale reddish-brown. The secondaries on the upper side are pale fulvous. Under side: The wings are marked very much as in *I. albibasalis*. Expanse, 26 mm.

121. *I. brunneicosta*, sp. nov. ♂. Body and legs pale luteous. Upper side of the primaries is very pale luteous with the costa heavily marked with dark brown, especially at the middle, where the dark brown shade extends inwardly, covering the end of the cell. The outer margins are also clouded with brown and about the middle of the marginal area is a very heavy dark brown spot, margined externally by pale luteous. There are also one or two dark brown subapical marks and obscure transverse median and transverse limbal lines. The secondaries are uniformly very pale yellowish-gray. The under side of both wings is colored like the upper side of the secondaries, save that the brown costal mark on the primaries reappears faintly upon the lower side. Expanse, 22 mm.

122. *I. albicostata*, sp. nov. ♂. The collar and upper side of the thorax are dark brown; the upper side of the abdomen pale brown; pectus and forelegs dark brown; lower side of thorax and abdomen pale brown. Upper side: The primaries have the inner half broadly rich brown marked with

numerous narrow transverse darker lines. At the base, the wings are chalky-white with a heavy dark brown area just beyond. The upper half of the wing from the base of the costa outwardly is chalky-white, save just before the apex, where this white area is interrupted by a series of dark brown transverse limbal markings, which are followed by some minute submarginal dashes. The fringes are pale brown, palest at the apex, and uniformly checked with dark brown. The secondaries above are pale fulvous. Under side: Both wings below are pale fulvous with the costa and middle area of the primaries faintly clouded with fuliginous. Expanse, 30 mm.

123. *I. diluta*, sp. nov. ♂. The body and legs are uniformly pale cinereous. The primaries on the upper side are chalky-white clouded on the inner margin with pale brown and traversed on the inner half by incomplete, sub-basal, median, limbal, and submarginal pale brown lines, the outer lines being produced farther in the direction of the costa than the sub-basal lines. The fringes of the primaries are dark brown checked with pale brown. The secondaries are uniformly pale shining white. On the under side both wings are whitish, the primaries having a very dark brown ray extending along the costa from the base to the apex, the costal edge being white. Expanse, 20 mm.

124. *I. flava*, sp. nov. ♂. The body and legs are pale yellowish-cinereous. Upon the dorsal line of the primaries is a series of three or four minute dark brown tufts of scales. The primaries are pale luteous-brown clouded on the middle and outer margin of the wing with obscure darker brown markings. The secondaries are pale grayish-luteous with some obscure dark brown markings at the anal angle. The under side of both wings is very pale yellowish-gray, the darker bands and spots of the upper side reappearing more or less obscurely. There is considerable variation among the specimens. Expanse, 23 mm.

125. *I. pallida*, sp. nov. ♂. Body obscure grayish. Primaries whitish on the upper side with the costa clouded with greenish-gray. There are a number of obscure transverse dark cloudings on the costa, and minute blackish dots scattered over the basal half. There is an obscure discal dot at the end of the cell. Beyond this, there are two very narrow angulated and parallel blackish lines, between which there is a paler area. On the margin opposite the end of the cell, there is a comparatively large brown spot. The margin is accentuated by a series of brown dots on the interspaces. The fringes are very pale ashen, checked with paler gray. The secondaries are whitish, slightly clouded with gray at the outer angle. On the under side, both wings are whitish. The costal area of the primaries is clouded with dark gray and the secondaries have on their costa near the outer angle two parallel and incomplete transverse lines. Expanse, 22 mm.

126. *I. fusca*, sp. nov. ♂. Body wood-brown, primaries and secondaries of the same color, the outer margins of both wings clouded with darker brown. The primaries are marked on the cell by a number of minute blackish dots. The fringes of the primaries are dark brown, of the secondaries, pale cinereous. On the under side, both wings are paler, both have a conspicuous discal dot at the end of the cell. The primaries have a submarginal series of conspicuous dark brown dots running in a straight line from below the apex near the outer angle. The secondaries have two or three conspicuous submarginal brown dots near the outer angle and a conspicuous brown patch of scales at the anal angle. Expanse, 26 mm.

OLENE, Hübn.

127. *O. costiplaga*, sp. nov. ♂. Front, collar, and patagia whitish; thorax and abdomen pale cinereous above; and on the dorsal line of the abdomen there is a narrow raised crest of dark gray hairs; the pectus is dark brown; the lower side of the abdomen,

gray. The primaries are dark fuliginous with the apex and the inner margin whitish. The white apical area is interrupted by a conspicuous dark brown spot, having the form of a compressed comma. The secondaries are grayish with the costa and outer margins lighter. On the under side, both wings are whitish with the middle area of the primaries from the cell toward the outer margin clouded with dark gray. There is an obscure discal dot at the end of the cell of the secondaries. Expanse, 40 mm.

128. *O. kyloica*, sp. nov. ♂. Front whitish; collar brownish-gray, marked on the median line in front by a raised tuft of dark brown scales; patagia yellowish, tipped with reddish-brown; upper side of the thorax and abdomen dark brown; the tip of the abdomen whitish; the lower side of the abdomen and thorax and the legs are grayish-white. The prevalent color of the primaries is pale purplish brown, interrupted by a wedge-shaped area of lighter color, extending from about the middle of the cell to the apex, and interrupted by a dark brown ocellus at the end of the cell, some narrow lines of dark brown beyond this ocellus, parallel to the median nervules, and by a dark brown dash on the costa before the apex. In addition to these markings, there is a dark transverse basal and a geminate transverse median line beyond this darker marking. The secondaries are white. On the under side, both wings are whitish-gray with distinct lunulate discal markings at the end of the cell, those of the primaries being most conspicuous. In addition, the markings of the upper surface of the primaries faintly reappear upon the lower side. Expanse, 42 mm.

NODA, Walk.

129. *N. agrotoides*, sp. nov. ♂. Front fuscous; antennae and entire thorax and abdomen, except the tip of the latter, which is brown, luteous. Upper side: Primaries

lilacine-brown, except at the outer angle, which is pale ashen. The primaries are crossed by numerous marks and striae as follows: an irregularly curved sub-basal line, luteous, defined inwardly very narrowly by dark brown followed by a dark annulus on the middle of the cell, and an obscure one at the end of it; below the cell beyond the base near the inner margin is a dark brown patch of raised scales having the form of an oblong parallelogram; there are obscure and very narrow transverse limbal and transverse sub-marginal lines with spots and striae upon the costa. The secondaries are whitish shaded with fuscous on the outer margin. Under side: the wings are whitish, silky, with the basal and median area of the primaries clouded with fuscous. Expanse, 28 mm.

130. *N. nigristriata*, sp. nov. ♂. Front, body, and appendages whitish. Upper side: Primaries chalky-white on the costal half and on the inner half very pale luteous. There is a white curved sub-basal line, and a similar curved white line running from below the apex on the outer margin to the inner margin, two-thirds of the distance from the base. Between these two lines there is a broad blackish clouding below the end of the cell, continued outwardly towards the outer margin above the origin of the outer white line. Above this clouding below the apex at the outer margin is a narrow blackish ray. There is a minute black annulus at the end of the cell. The secondaries are pure white. Under side: Both wings are white tinged with creamy. Expanse, 25 mm.

131. *N. erubescens*, sp. nov. ♂. Body whitish with the pectus and legs tinged with pink. Upper side: The primaries are bright pink, except at the outer angle, where they are suffused with creamy-white. There is a poorly defined sub-basal line of darker pink and an annulus of darker pink at the end of the cell. The secondaries are creamy-white. Under side: Both wings are creamy-white

with the costa of the primaries heavily laved with light pink and the margins of the secondaries slightly tinged with the same color. Expanse, 30 mm.

ARGILA, Walk.

132. *A. affinis*, sp. nov. ♂. Closely related to *A. basalis*, Walk., from which species it differs in having the dark sub-basal band, which separates the yellow area at the base of the wing from the rest of the wing, incomplete, and the entire costal half of the wing uniformly brown, the dark sub-basal band being represented simply by a subquadrate spot upon the inner margin near the base. The marginal and sub-marginal markings also differ from those of *A. basalis*, being more distinct and darker towards the outer angle. Expanse, 27 mm.

133. *A. basalis*, Walk. ♀. The female differs from the male in the much lighter color of the wings, and in having the primaries very greatly produced and strongly arcuate on the costa before the apex. The abdomen also, in the gravid specimens before me, is one-half longer than the posterior margin of the secondaries. The expanse of wings is, further, very much greater than that of the male. Expanse, ♂, 27 mm.; ♀, 38 mm.

TERPHOTHRIX, gen. nov.*

♂. Palpi small, compressed, third joint very minute. Antennae about one-third as long as the costa of the primaries, heavily pectinated the whole of their length, the pectinations compressed laterally and the extremity of the culmen curved downwardly. Legs moderately hairy, the last pair armed with a double pair of spurs, one at the extremity of the tibia, and the other pair about the middle. The second pair of legs have the tibiae enormously swollen at the extremity,

the enlargement being densely covered with scales. This feature is especially noticeable in the female. The upper part of the abdomen is adorned with long tufts of hair, which are parted and spread out laterally in the case of the first four immediately succeeding the thorax. The two nearest the anal extremity are compressed and directed upwardly. The peculiar arrangement of these bunches of hair on the dorsal line of the abdomen presents somewhat the appearance of the tufts which are found on the backs of some cochliopod larvae. The primaries are subtriangular with the costa slightly rounded before the apex; the outer margin nearly straight; the outer angle obtuse; and the inner margin straight. The secondaries are subpyriform.

♀. The female is very like the male but larger and with a much stouter body, and has not, in any of the specimens before me, any trace of the very peculiar tufts, which are found on the back of the male. Type, *T. lanaria*, Holland.

It is worthy of remark that the peculiar tufts are very liable to be abraded in dried specimens, and it is possible that these tufts may be found also in the female, though four very well preserved specimens do not reveal any trace of them, except one in which two minute tufts appear toward the anal angle.

134. *T. lanaria*, sp. nov. ♂. Front and upper side of abdomen creamy-white. Anterior wings creamy-white, with the middle area clouded with warm brown. There are a series of dark dots upon the costa, one beyond the end of the cell, and two before the apex, the innermost of which is the smallest. There is a narrow light sub-basal transverse line and a transverse submarginal line produced on the second median nervule toward the margin, both of which lines are pale, shaded on the side toward the base with darker brown markings. At the point where the submarginal line is produced outwardly, there are a series of blackish spots defined in-

* $\pi\acute{\epsilon}\rho\phi\omicron\varsigma$ = tergus; $\theta\rho\acute{\iota}\xi$ = capillus.

wardly by creamy dots and succeeded outwardly by black checks upon the fringes. The secondaries are pale creamy-white touched with dark brown on the fringes about the middle of the outer angle. The under side of both wings is white with the base and middle area of the primaries dark fuliginous. The black checks on the fringes of the upper side reappear upon the lower side.

♀. The female does not differ essentially from the male in markings, save that on the upper side of the secondaries there are some dark brown cloudings which are reproduced upon the lower side. Expanse, ♂, 25 mm.; ♀, 30 to 32 mm.

ORGYOPSIS, Feld.

135. *O. tenuis*, sp. nov. ♀. Body creamy-white. Primaries white laved with very pale ferruginous at the apex and on the outer margin. There is a very minute black dot in the middle of the cell, two very slender lines forming a letter K at the end of the cell, a curved and crenulate pale sub-basal line with a geminate very faint transverse sublimbal line, the area between these two lines near the inner margin being clouded with pale fawn. There is a minute white spot at the apex of the primaries followed by four or five dark brown semi-lunate markings on the outer margin below the apex, the third of these spots being defined inwardly by a white sagittate mark. The upper side of the secondaries is pure white. The under side of both primaries and secondaries is likewise pure white. Expanse, 29 mm.

NOTODONTIDAE.

SOMERA, Walk.

136. *S. chloauchena*, sp. nov. ♂. Front pale green; antennae testaceous; upper side of thorax and pectus grass-green; upper side of abdomen very pale green; the lower side of thorax and abdomen white; on the dorsal

line of the abdomen immediately behind the thorax is a large raised tuft of scales, green in the centre and dark brown on the sides. Upper side: The primaries are pale green crossed beyond the base by a paler line curving from the costa near the base toward the middle of the inner margin and defined outwardly by a broad band of dark green. There is a discal dot in the cell and a curved transverse limbal line of raised whitish scales beyond the cell, the patches of raised scales composing this line being defined outwardly and inwardly by narrow lines of dark green. There is a submarginal series of raised patches of white scales at the extremities of the interspaces defined externally by dark green; a marginal series of narrow dark lines on the interspaces. The fringes are white. The secondaries are whitish with the costa and the outer angle more or less heavily clouded with green and the extremities of the nervules beyond the cell being marked with dark brown. The marginal markings and the fringes of the secondaries are as on the primaries. Under side: On the under side both wings are white with the costa near the base and the outer area of the wing just beyond the cell clouded with purplish-black. Expanse, 37 mm.

137. *S. desmotis*, sp. nov. ♀. Antennae testaceous; front, pectus, thorax, and extremity of abdomen pale green; the upper side of the abdomen brownish; lower side of thorax whitish. Upper side: Primaries pale green like the thorax, crossed by a broad dark brown band with its outer margin produced beyond the end of the cell and curved and excavated inwardly and outwardly. Its inner edge toward the base is marked by a very irregular darker curved transverse basal line. The secondaries are brownish with the outer angle and the margin narrowly green. Lower side: The wings are uniformly gray shading into paler, almost whitish, near the base, especially in the secondaries. Expanse, 55 mm.

138. *S. chloromorpha*, sp. nov. ♀. Antennae dark brown; front, collar, and upper side of thorax olive-green; legs and pectus brown; lower side of abdomen whitish. Upper side: Primaries olive-green with a pale whitish median fascia, beyond which are three dark olive bands running parallel to it, and below the apex a similarly curved olive line running outwardly and succeeded by a series of marginal olive dots. The basal area is dark olive with a large patch of blackish raised scales on the inner margin near the base. The fringes are dark brown. The secondaries are uniformly fuscous, the fringes paler. Under side: Both wings are pale fuliginous with the costae and outer margins narrowly pale gray. Expanse, 40 mm.

139. *S. bitroides*, sp. nov. ♂. Allied to *S. bitia*, Stoll, but not so large, paler in color, and differently marked. Antennae testaceous; front whitish; collar, tegulae, and upper side of thorax pale green; upper side of abdomen pale brown; pectus dark brown; lower side of thorax and abdomen whitish; legs tinged with brownish. Upper side: Primaries pea-green with a profusion of darker green and brown transverse lines and spots. The most conspicuous markings are a series of small brown spots running along the costa, a transverse limb series of sagittate brown spots, of which the spot upon the second and third median nervule is the most conspicuous. There is a submarginal series of curved brown lines at the extremities of the interspaces. The secondaries are rosy-brown, except on the costal margin near the outer angle, where they are tinged with greenish and marked by three or four incomplete transverse bars of dark brown. Under side: The wings are uniformly pale purplish-brown, the secondaries somewhat lighter than the primaries.

♀. The female is marked very much as the male, but the wings are broader and the markings of the primaries heavier and not so distinctly defined. Expanse, ♂, 37 mm.; ♀, 39 mm.

140. *S. chloëropsis*, sp. nov. ♂. Palpi on the under side pale brown; front dark brown; antennae testaceous; collar, tegulae, and upper side of thorax dark grass-green; upper side of abdomen dark brown; end of the abdomen tipped with dark green hairs; lower side of abdomen pale fulvous; legs concolorous. Upper side: Primaries uniformly dark grass-green with a multitude of minute and vaguely defined spots and lines of slightly paler color, defined, especially on the margin, by very narrow lines of raised brownish scales. The secondaries are uniformly purplish-brown except on the costa and near the outer angle, where they are tinged with pale green and marked by incomplete bars of darker brown. Under side: The wings are purplish-brown, paler toward the base. Expanse, 36 mm.

141. *S. chloana*, sp. nov. ♂. Thorax and abdomen much as in the preceding species, but the legs are heavily clothed with green scales upon the outer side of the tibiae. Upper side: Primaries dark grass-green with obscure transverse basal, transverse median, and transverse submarginal lines of pale brown, defined outwardly and inwardly by dark green. On the cell and near the base are a number of small circular patches of dark brown raised scales. The secondaries are bright yellow from the base to near the outer margins, which together with the costa are heavily bordered with dark brown. The fringes are pale whitish. Under side: The wings are yellowish with the cell and outer area of the primaries beyond the cell heavily clouded with dark brown. Expanse, 40 mm.

142. *S. infima*, sp. nov. ♂. Front brownish-green; upper side of thorax and abdomen obscure olive; lower side paler; legs margined outwardly by dark olive. Upper side: Primaries obscure olive-green with the fringes regularly checked with blackish. At the end of the cell, there is an obscurely defined annulus formed by dark raised scales surrounding a paler space. Be-

A NEW SPECIES OF STENOBOTHRUS FROM CONNECTICUT,
WITH REMARKS ON OTHER NEW ENGLAND SPECIES.

BY A. P. MORSE, WELLESLEY, MASS.

Stenobothrus olivaceus, sp. nov. Closely approaching *S. maculipennis* Scudd. Head conical. Face very oblique. Vertex nearly horizontal; acute at apex, in the ♂ more, in the ♀ less, the sides slightly excavate; narrow between the eyes, in the ♀ about equal to the width of an eye, in ♂ less; slightly expanded at anterior margin of eyes. Central foveola of vertex rather deep; its edges broad, raised; its depression slightly (♂) or distinctly (♀) in advance of eyes, removed from the tip of vertex about two-thirds (♂) or one-half (♀) the distance between eyes. [See fig.] Facial costa shallowly sulcate, more deeply so than in *maculipennis*, the margins sharp; at meeting with the vertex angulate, not rounded as in *maculipennis*. Lateral foveolae distinct. Eyes slightly smaller and less prominent than in *maculipennis*; seen from the side the upper front portion is more angulate in ♀, more rounded in ♂ than in *maculipennis*. Antennae rather short, variable, about equal to head and prothorax; slightly flattened toward the base, at tip gradually tapering to a fine point. Thorax rather stout. Pronotum with the median carina distinct, sharp. Lateral carinae distinct; on the anterior half of prozona subparallel or slightly convergent, on the remaining portion of pronotum evenly divergent. Their course is straighter, less made up of curves, and less convergent on the prozona than in *maculipennis*. Tegmina long, passing hind femora by one-eighth to one-sixth their length. Wings longer and more pointed than in *maculipennis*. Hind femora long, passing tip of abdomen, and rather slender.

Color. In general either olivaceous-brown or light green above, paler brown below; with the usual dark longitudinal band along lateral carinae of pronotum and middle of

tegmina less sharply defined and in the male becoming obsolete. The colors are dead and have a faded appearance, with a peculiar olivaceous tinge matching the tints of the vegetation of its haunts. The dusky bands of the tegmina are less distinct in brown than in green specimens, and in males than in females. Brown specimens are the more plentiful.

Green specimen, fresh. Face and cheeks pale pea-green. Eyes brown or slate, considerably darker than surroundings. Clypeus, labrum and mouthparts light brown, palpi paler or white. A brown or fuscous band running backward from upper half of each eye over occiput. Antennae light brown at base, darker toward tip. Pronotum pale pea-green; the sides with a dark band running along the dorsal third, black nearest carinae, crossing them upon the disk of metazona. Lateral carinae pale green or whitish.

Meso- and meta-thorax with the sides pale green. Pectus light brown. Tegmina pale green; opaque, becoming translucent on apical half; a dark median band, composed of nearly confluent small dusky spots extending usually one-third, rarely two-thirds, its length, the edges indistinct; this band is narrower and shorter than in *maculipennis*, the spots smaller and less distinct. Wings transparent, veins and venules dusky; preapical fourth of costal margin opaque greenish, the veins heavily infuscated. Femora green or brownish, tibiae and tarsi light brown; spines of hind tibiae tipped with black.

Abdomen with the dorsum brown, lightest at sides and on narrow median line, bordered below by a broad griseous or fuscous band punctate with black; pleurae palest, light brown; venter light brown; ovipositor brown, black at extreme tip.

Brown specimens vary from pale brownish

straw to a rather dark olive-brown above, lighter and of a more olivaceous cast below. The occiput generally shows the usual two dusky longitudinal lines. Sides of pronotum varied in middle third with dusky brown and pale griseous, the ventral third light gray or white. Episterna of metathorax with pale oblique bands running downward toward fossa 3. Hind femora brown above and below; tibial groove greenish; disk pale gray or nearly white on proximal half, its midline often dusky interrupted with pale, forming two sub-distinct dusky spots on proximal two fifths of femora, which are indistinct in dry specimens; inner side similar to outer except that the ground-color is paler and the spots darker.

Measurements. Antenna: ♂, 6-7 mm.; ♀, 6. Hind fem.: ♂, 10-10.5; ♀, 12.5-14. Teg.: ♂, 14-15; ♀, 17-21. Body: ♂, 16.5-18.7; ♀, 21-25. Total length: ♂, 19-20.7; ♀, 23.5-28.

180 ♂, 167 ♀.* Greenwich and Stamford, Conn., Aug. 11th to 28th.

This species though not widely spread was locally very plentiful in the salt marshes, its green and olivaceous tints closely matching in color the marsh grasses in which it made its home. The ground beneath was often overflowed at high tide and offered a retreat

to myriads of fiddler-crabs, being much wetter and of a wholly different character from the situations frequented by *maculipennis* and *aequalis*.

As has been stated this species closely approaches *maculipennis*. Some of the brown females bear a superficial resemblance to long-winged specimens of *curtipennis*, but the antennae and head readily distinguish them therefrom.

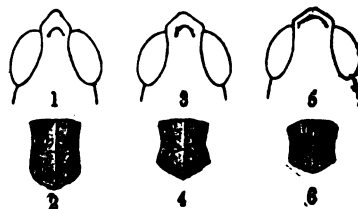


Fig. 1, *S. olivaceus*, ♂. Fig. 2, *S. olivaceus*, ♀. Fig. 3, *S. maculipennis*, ♂. Fig. 4, *S. maculipennis*, ♀. Fig. 5, *S. aequalis*, ♂. Fig. 6, *S. aequalis*, ♀. Figs. 2, 4, 6, $\times 2$ diameters.

Compared with *maculipennis*, the vertex is more nearly horizontal, more acute, more angulate with the front in profile; more narrowed between the eyes; the depression of the central foveola further removed from the apex. The face is more oblique; the antennae are shorter, more flattened toward base, and more finely pointed. The disk of the prozona is broader, its sides less incurved, their outlines formed by straight lines rather than curves, and the metazona very nearly as long as the prozona.

From *aequalis* also it is readily distinguished by the characters of the head and vertex mentioned above, while the disk of the pronotum is proportionally much more narrowed anteriorly and the metazona much longer.

In sorting these species I have found it easier, owing to their larger size, to separate the females first.

It seems best to make a few statements

*Owing to the large number of types on hand specimens will be sent, for the accommodation of other students of the family, to a number of collections in various parts of the country, as follows:—

Museum of Comparative Zoology, Cambridge, Mass.

Mr. S. H. Scudder, Cambridge, Mass.

Mr. Samuel Henshaw, Cambridge, Mass.

Massachusetts Agricultural College, Amherst, Mass.

American Museum of Natural History, New York.

Cornell University, Ithaca, N. Y.

American Entomological Society, Philadelphia, Pa.

National Museum, Washington, D. C.

Mr. W. S. Blatchley, Terre Haute, Ind.

State Experiment Station, St. Anthony Park, Minn.

University of Nebraska, Lincoln, Neb.

Prof. Lawrence Bruner, Lincoln, Neb.

Leland Stanford, Jr., University, Palo Alto, Cal.

Entomological Society of Ontario, London, Canada.

National Museum, Ottawa, Canada.

here concerning the other two species referred to,—*S. maculipennis* Scudd. and *S. aequalis* Scudd. From my collections gathered during the last three seasons and notes concerning them taken in the field, I am fully convinced of the distinctness of these species.

■ *S. aequalis* I have found one of the most plentiful locusts in New England, everywhere common on dry soil, and very variously colored. With this species I unite *S. bilineatus* Scudd.

S. maculipennis on the other hand I have taken only in Southern New England, where I have found it most plentiful near the coast, preferring sandy soils. This species also is very variously colored. Individuals of both species may be wholly either brown or green or any mixture of the two, but green males are the least common of any of the forms and in some places are exceedingly scarce. Not infrequently specimens show considerable

rose-red above or may be very largely blackish-fuscous throughout.

The structural characters presented by the head, vertex, and pronotum are the best means of separating these species from each other and from *olivaceus*, but the length and markings of the tegmina are also helpful.

It may be of interest in this connection to state that I have examined some of the specimens collected by Prof. S. I. Smith at Norway, Me., and referred to in his paper on the Orthoptera of Maine as *S. maculipennis*, and also some in the collection of Cornell University collected in New York and referred to in Prof. Comstock's Introduction to Entomology under the same name. All of these I am disposed to consider as belonging to *aequalis*. Some of the Norway, Me., specimens show an unusual length of wing but assuredly are not *maculipennis* Scudd. I have also examined the types in Mr. Scudder's collection.

ADDITIONS TO THE LIST OF BOMBYCES AT POUGHKEEPSIE.

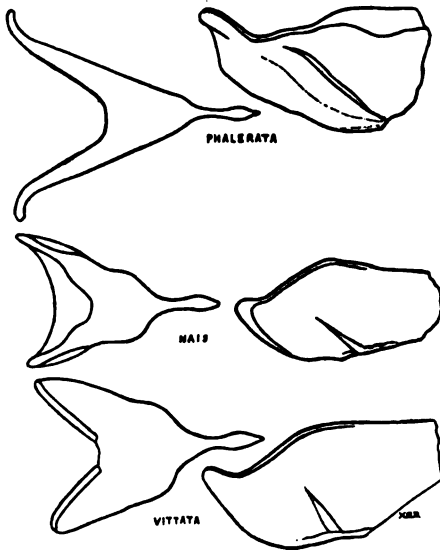
BY HARRISON G. DYAR, BOSTON, MASS.

In the August, 1891, number of *Psyche* I gave a list of the Bombyces found in Poughkeepsie, N. Y., and included four species of *Arctia*. Further study has shown that this list must be increased to seven species. From my series of *A. virgo* I have picked out two specimens which are referable to *A. intermedia* Str. They are of the form in which the markings of the fore wings are practically as in *A. virgo*, being less extensive than in Stretch's figure. This form differs from *A. parthenice* Kirby only in size, and may prove to be a southern race of it. *Parthenice* occurs not rarely at Plattsburgh, N. Y.; but I have never met with it in Dutchess County. The ♂ genitalia of these forms

do not differ specifically. I have made drawings from balsam mounts and cannot find any differences which are greater than the range of individual variation. From the same parts in *A. virgo* they differ slightly and probably to a degree which is specific.

Under the term *nais* in my list were included all the forms with the pattern of marking of that species. I am now satisfied that we have not two species, *nais* and *decorata*, as they stand in Professor Smith's list, but three well defined and distinct species, differing in markings of the moth, in the larva according to the observations of Prof. G. H. French and Mr. J. Doll, and in the structure of the ♂ genitalia. In another

paper, in conjunction with Mr. Neumoegen, I give at some length descriptions of these species. Here I will give the synonymy, the accompanying figures of the genitalia and a table of species.



Some of the synonyms given below may be worthy of varietal rank; but I have not access to all the publications and cannot determine the matter.* The references are from Kirby's Catalogue of Lepidoptera Heterocera, Vol. I.

EUPREPIA (APANTESIS) NAIS Drury.

1773—Drury, Ill. ex. ent., i, pl. 7, f. 3. *Noctua*.

cuneata Goeze.

1781—Goeze, Ent. Beytr., iii (3) p. 65, n. 101. *Noctua*.

deffloriana Martyn.

* I have not seen *deffloriana* Martyn or *vittata* Fabr. The form of *nais* described by Butler as *ochreatea* is worthy of varietal rank if it is different from *deffloriana*; also the two forms of *vittata* with red and yellow hind wings respectively, when the names can be correctly assorted.

1797—Mart., Psyche, pl. 28, ff. 78, 79. *Bombyx*.

ochreatea Butler.

1881—Butl., Ent. mo. mag., xviii, 136. *Arctia*.

E. (A.) PHALERATA Harris.

1841—Harr. Ins. Mass., p. 274. *Arctia rhoda* Butler.

1881—Butl., Ent. mo. mag., xviii, 136. *Arctia*.

incompleta Butler.

1881—Butl., Ann. mag. nat. hist., (5) viii, 311. *Arctia*.

E. (A.) VITTATA Fabricius.

1787—Fabr., Mant. ins., ii, p. 127, n. 164. *Bombyx*.

radians Walker.

1855—Walk., Cat. Brit. mus., iii, 632.

Apantesis.

decorata Saunders.

1863—Saund., Proc. ent. soc. Phil., ii, 60. *Arctia*.

colorata Walker.

1864—Walk., Cat. Brit. mus., xxxi, 301. *Aloa*.

In tabular form, the specific differences appear thus:—

- A. Costal edge of primaries black.
 - a. Secondaries ocher yellow, rarely tinged with pink; dorsal abdominal black band tapering posteriorly. *nais*.
- B. Costal edge of primaries yellow, except at apex.
 - a. Expanse 34–38 mm.; marks of primaries complete or nearly so; abdomen rosy red, the black dorsal band tapering posteriorly; secondaries rosy red along abdominal margin in ♂, crimson in ♀, the spots rarely confluent. *phalerata*.
 - b. Expanse 38–43 mm.; marks more or less incomplete, usually markedly so; abdomen ocher yellow, the dorsal black band widened and diffuse posteriorly, often covering most of the surface; secondaries red or ocher yellow with a marginal band of confluent black spots. *vittata*.

EARLY STAGES OF TWO JAMAICA NYMPHALIDAE.

BY T. D. A. COCKERELL.

AGANISTHOS ORION. Egg laid on under side of leaf of trumpet tree, subglobose (*not* barrel-shaped or conoid) with 18 strong ribs each of which bears a row of minute but well developed spines which are more or less bulbous at tips; color of shell bluish white.

Young larvae, brought by Mrs. Swainson March, 1892, presumed to be this species. Length about 6 mm. Head white subtranslucent, shiny. Body yellowish white (the eighth segment above decidedly yellow) with very long hairs, which arise from prominent tubercles; these hairs are all minutely but distinctly bristly (or barbed?), the bristles (barbs) mostly alternate but toward tip of hair alternate; about eight or nine hairs arise from each tubercle, the central one larger, more bristly and black. The thoracic legs have two claws.

Older larva from Mrs. Swainson, Bath, Nov. 3. About 49 mm. long, 8 mm. broad, cylindrical. Head heart-shaped, broadly notched above pale brownish with a thick black cross in middle of face cutting the ground color into four portions; cheeks black

with numerous short rather pale spines, and a thick black projection, 2 mm. long, blunt and shiny on each side of the crown, each with 5 spinules. Body beneath and abdominal legs red-brown; above dark red brown, the thoracic legs, thoracic and anal plates black; numerous bright apple green transverse bands above, four to each of the middle segments variously broken and coalesced on the others; they alternate with equally broad bands of the ground color so that it might equally well be described as green above transversely banded with brown. There is a narrow mid-dorsal green band, and on the middle segments two green spots in front of each spiracle; also a minute green point and a black patch in the subdorsal region. The spines branch at their summits and are not centrally produced beyond, the radiate branches being longer than the spines. The spines are pale yellow but the branches of the dorsal spine are black. The following table, in which the arabic numerals indicate the number of branches of each spine, will show their general disposition:—

Body Segments	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII
Dorsal				4	4	4	4	4	4	4	4	6
Subdorsal	2	5	4		2							
Lateral	1	1	2	2	4	4	4	4	4	3	4	2 4-5
		1	1	2	1 2	1 2	1 2	1 2	1 2	1 1	1 2	

GYNAECIA DIRCE. Larva about 30 mm. long. Head shiny black, with five or six short white spines on each side, and at each

upper external margin a long slender spine, broader and truncate at tip, whitish with brown end and beset with scattered

short spinules. Body including legs velvety black, but there is a pale yellow patch on each side of each segment except the 2d, 4th and last; these patches are situated near the anterior border of the segments and are largest on 7th-10th. The first body segment bears dorsally two white pointed spines of moderate length; the other segments bear spines stellate at their summits,

though the spine itself is continued beyond the branching so as to look like an upright ray, being but little larger than the divergent spines; the thicker basal part of the spine is again a little longer than the produced terminal portion. Their disposition is shown in the following table, in which the figures indicate the number of divergent lateral radii:—

Body Segments	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII
Dorsal		5	5-6	4	4	4	4	4	4-5	5	5-6	6-7
Subdorsal			6-5-3	4	4	4	4	4	4	4	4	
Lateral				4	4	4	4	4	4	4	4	
	White			Yellow.						White.		

A younger larva about 21 mm. long is like the adult, except that the long spines on the

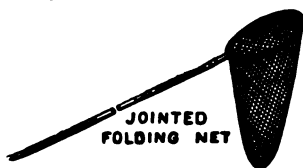
head are altogether blackish and all the body spines are yellow.

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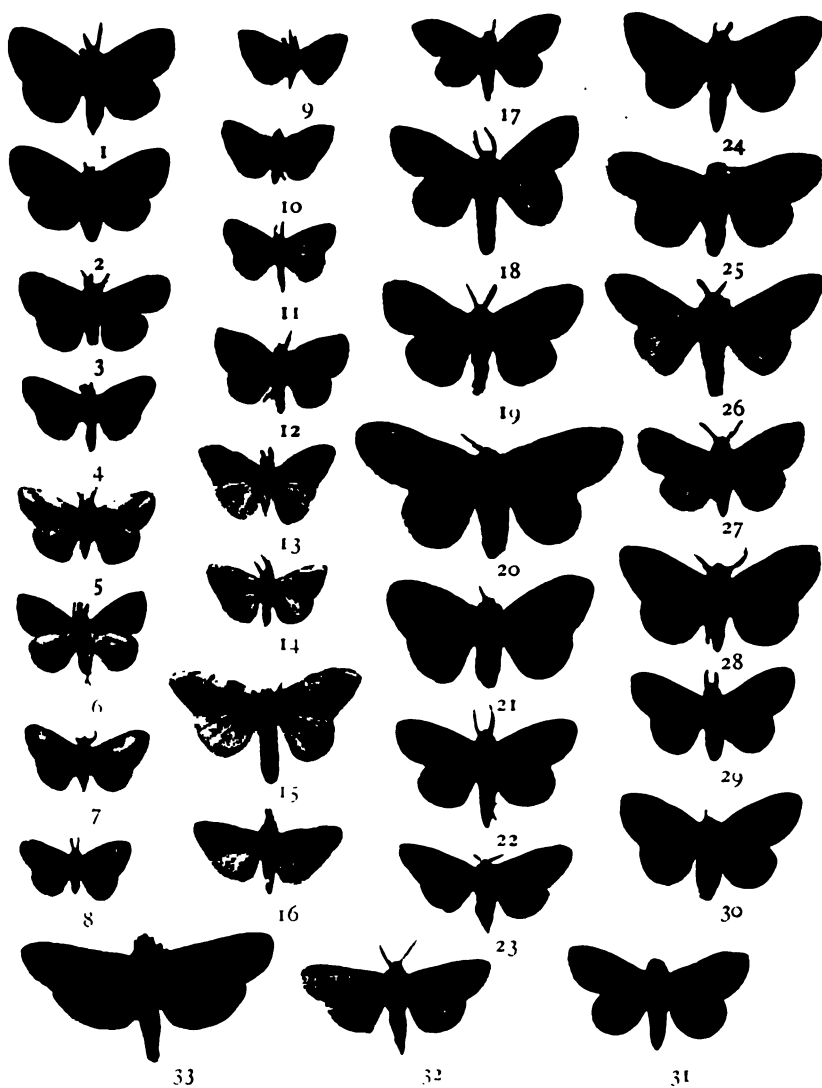
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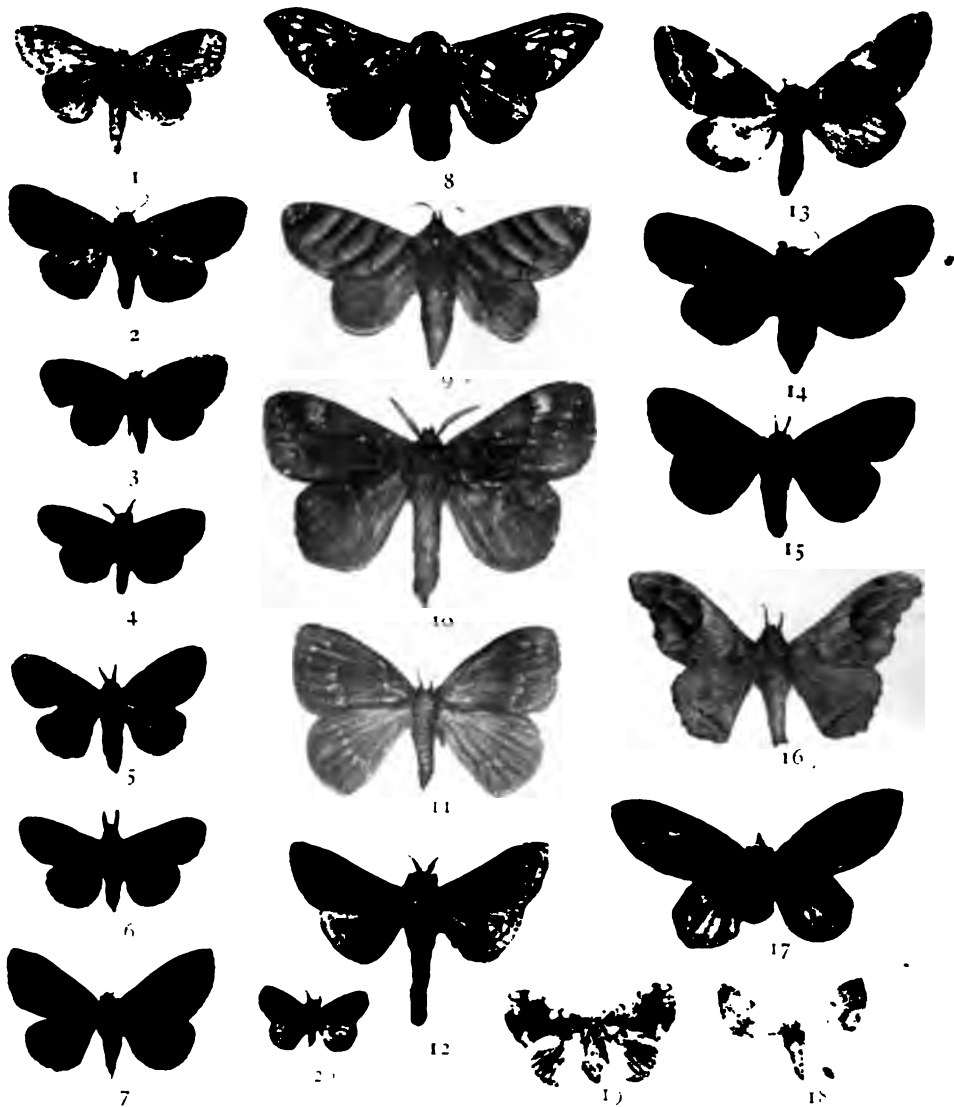
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PSYCHE.

THE PRIMITIVE NUMBER OF MALPIGHIAN VESSELS IN INSECTS.— II.

BY WILLIAM MORTON WHEELER, PH.D., CHICAGO, ILL.

APTERYGOTA. In searching for the ancestral conditions of the Malpighian vessels it is natural to turn first to this group. The few data are, however, very unsatisfactory on account of the wide differences between the statements of authors. As an example we may take *Lepisma*. According to Ramdohr* this insect has two Malpighian vessels; according to Treviranus,† Rovelli,‡ Gegenbaur§ and v. Siebold,|| four; according to Leuckart,¶ six; according to Schindler,** eight. Fernald says†† that he was unable to ascertain

the number, but feels certain that there are at least four.

In *Machilis Grassi** found twelve Malpighian vessels, uniting in pairs and hence "on peut les considerer comme étant au nombre de six." But Oudemanns,† who has studied the anatomy of *Machilis* very carefully, finds twenty vessels, uniting in pairs and opening by means of ten apertures at the junction of the mid and hind-guts.

Campodea has about 16 Malpighian vessels according to Grassi.‡ These organs were seen by Oudemanns§ but he failed to ascertain their exact number.

According to Grassi|| both *Nicoletia* and *Lepismima* have six Malpighian vessels, opening separately into the hind-gut.

* Abhandlung ueber die verdauungs werkzeuge der insecten. Halle, 1811.

† Vermichte schriften Bd. ii heft. 1, p. 15. Göttingen, 1816.

‡ Alcune ricerche sul tubo digerente degli atteri, ortotteri e pseudo-neurotteri. Como., 1884.

§ Grundriss, etc., 1874, p. 292.

|| Anatomie d. wirbellosen, p. 625.

¶ Frey u. Leuckart, Anatomie u. physiologie d. wirbellosen, p. 102.

** Beiträge zur kenntniss der Malpighi'schen gefässe der insecten. Zeitschr. f. wiss. zool. Bd. 30, 1878, p. 602.

†† The relationships of arthropods. Studies biol. lab. Johns Hopkins univ. vol. iv, no. 7, 1890, p. 464.

* Les ancêtres des myriapodes et des insectes, tome xi, 1889, p. 310.

† Bijdrage tot de kennis der Thysanura en Collembola, Amsterdam, 1887, p. 66.

‡ loco citato, p. 310.

§ l. c. p. 67.

|| l. c. p. 311.

Haliday,* Meinert† and Grassi‡ agree in stating that Malpighian vessels are absent in Iapyx.

Opinions are divided as to the occurrence of Malpighian vessels in the Collembola. Nicolet§ thought he saw three pairs in Podurids and figures them in *Podura similata*. Frey and Leuckart|| and v. Siebold¶ also mention six as the number in Podurids. DeOlfers** saw only four in the Collembola.

On the other hand, Laboulbene†† and Fernald‡‡ find no trace of Malpighian vessels in *Anurida maritima*. Schindler§§ failed to find them in *Podura arborea*, and Lubbock||| had no better success with *Orchesella fastuosa* (a species in which they were figured by von Olfers), *Tomocerus plumbeus*, *Smynturus* and other species. Tullberg's¶¶ results are also negative.

*Japyx, a new genus of insects belonging to the stirps Thysanura in the order Neuroptera. Trans. Linn. soc. vol. xxiv, 1864, p. 444.

† On the Campodæ, a family of Thysanura. Ann. mag. nat. hist. vol. xx (3) 1867, p. 372.

‡ l. c. p. 310.

§ Recherches pour servir à l'histoire des Podurelles. Nouv. mém. soc. helvet. d. sci. natur. 1841, p. 47 (pl. iv, fig. 2).

|| l. c. p. 102.

¶ l. c. p. 625.

** Annotationes ad anatomiam Podurarum. Diss. inaug. Berolini., 1862, p. 16.

†† Recherches sur l'*Anurida maritima*. Ann. soc. ent. France. 4^e ser. tome iv, 1864, p. 715.

‡‡ l. c. p. 468.

§§ l. c. p. 602.

||| Monograph of the Collembola and Thysanura. Ray soc. London, 1873, p. 75.

¶¶ Sveriges Podurider. Kongl. svenska vetensk. akad. Handlingar. bd. 10, no. 10, 1872, p. 22.

The majority of recent writers, among whom Oudemans deserves special mention, are of the opinion that the Collembola have no Malpighian vessels.

It is clear that no phylogenetic conclusions of any value can be drawn from the heterogeneous observations here given. After making all due allowance for errors of observation, it is safe to say that the Malpighian vessels of the Apterygota are in a state of what Baron v. Osten Sacken calls "morphological restlessness." The amplitude of variation within the group is very great, extending from twenty vessels in *Machilis* to none in *Anurida* and allied forms. There are grounds for believing that this variation is not a precursor of advancing development, but rather an expression of degeneration. Other organs—such as the eyes, tracheae, sexual organs—show a similar great range of structural variation and stamp the Apterygota as a group which has well nigh run its course in Hexapod evolution.

DERMAPTERA. In *Forficula auricularia* according to Ramdohr,* there are twenty Malpighian vessels, inserted in clusters of five on four protuberances of the chylific gut. In the same species Schindler† found the number of vessels to be greater than 30, and their insertions, if I understand him correctly, to encircle the gut regularly.

* l. c. p. 76.

† l. c. p. 604.

(Continued from page 476.)

yond this near the apex on the costa are some obscure darker markings, and near the outer angle is a small oval patch of raised dark brown scales. The secondaries are uniformly pale fuscous, slightly darker on the outer margins. Under side: The wings are pale grayish white with an obscure lunate discal mark at the end of the cell of the primaries, and a similar, but more conspicuous mark, at the end of the cell of the secondaries. These marks in both wings are followed by incomplete and obscure transverse limbal and transverse marginal lines. The fringes of the primaries on the under side are checked with dark brown, or blackish, as on the upper side. The fringes of the secondaries above and below are very faintly checked in the same way.

♀. What I take to be the female of this species resembles the male just described in all respects, save that it is larger and the general coloration is more uniformly olive-brown with the markings dark brown and somewhat more diffuse. The antennae, of course, are less strongly pectinated in this sex. Expanse ♂, 30 mm.; ♀, 35 mm.

143. *S. chloe*, sp. nov. ♂. Front pale brown; collar, tegulae and upper side of thorax dark green; upper side of abdomen and lower side of thorax and abdomen together with the legs pale ruddy, with the outer edges of the tibiae covered with pale green scales. Upper side: The primaries are bright pea-green, shading into greenish-white on the outer margin and traversed by obscure transverse basal, geminate transverse median, and geminate transverse limbal lines. There is an obscure dark green dot at the end of the cell, and some blackish markings on the costa and the outer margin near the apex. The fringes are uniformly pale whitish. The secondaries are pale ruddy-brown with the basal half darker brown, and on the costa tinged

with pale green, striped near the outer angle by three or four lines of dark green. On the under side, both wings are very pale and creamy tinged with ruddy, the inner two-thirds of the costa and the cell being clouded, with dark purplish-brown. Expanse, 33 mm.

144. *S. falsa*, sp. nov. ♂. Front, thorax, and abdomen brown; legs concolorous. Primaries dark brown with a multitude of irregular and vaguely defined transverse lines and markings of obscure gray, defined inwardly and outwardly by very narrow lines of dark brown raised scales. The fringes are pale regularly checked with dark brown on the interspaces. The secondaries are uniformly ruddy-brown with the costa near the outer angle barred with darker brown. On the under side, the wings are dark brown with the marginal area of both wings uniformly margined with paler brown. On the secondaries there is an obscure discal mark at the end of the cell, followed by a slightly paler transverse median fascia. Expanse, 35 mm.

145. *S. propinqua*, sp. nov. ♂. Allied to *S. bitioides*, from which it differs in having the fore wings relatively shorter, broader, and more rounded at the apex. The ground color of the primaries is greenish with geminate basal, sub-basal, and transverse limbal lines of brown with a pale green spot on the costa about the middle extending over the end of the cell. There is a uniform submarginal series of dark brown lunulate markings and some dark brown spots between this and the transverse limbal markings near the outer angle. The secondaries on the upper side are pale brown with the costa stramineous, banded near the outer angle with three incomplete bands of dark brown. The abdomen and the wings on the lower side are pale stramineous, the costa and outer area of the primaries being broadly laved with fuscous. Expanse, 33 mm.

NORRACA, Moore.

146. *N. signifera*, sp. nov. ♂. Front, collar, and anterior edge of patagia dark brown; posterior edge of patagia light rosy-brown; upper side of thorax and abdomen rosy-fawn; lower side of the abdomen and of the legs similarly colored. Upper side: the primaries are pale rosy-brown, darkest on the costa and at the apex. On the middle and at the end of the cell, are two obscure subquadrate spots of darker brown margined externally and internally by very fine parallel lines. Below the spot in the middle of the cell, there is a dark blackish subquadrate spot. There is a regular series of fine submarginal lines on the interspaces arranged in echelon from the apex to the outer angle. The secondaries are whitish slightly tinged with pale pinkish. Under side: both primaries and secondaries are uniformly pinkish-white. Expanse, 38 mm.

147. *N. brevipennis*, sp. nov. ♂. Wings relatively short and broad; front dark brown; occiput yellowish; patagia and upper side of thorax dark brown; upper side of abdomen lighter brown; under side of thorax and abdomen and legs pale brown. Upper side: Primaries dark brown with the base and a broad subtriangular patch above the outer angle on the margin pale yellowish. The pale area at the base is marked by two narrow dark brown lines forming a figure eight, the upper circle in which anastomoses with a narrow dark line situated on the median nervule. In the middle of the cell and near the end are obscure darker quadrate spots separated from each other by a pale spot. There is a series of submarginal dark lines on the interspaces parallel to the outer margin. The fringes, which are narrow, are dark brown. The secondaries, which are uniformly very pale brown, have the fringes narrowly dark brown. The wings on the under side are uniformly pale rosy-brown, the fringes being as on the upper side. Expanse, 28 mm. Habitat, Benita.

148. *N. lineata*, sp. nov. ♂. Front and collar dark brown; patagia, upper side of thorax and abdomen somewhat paler; under side of thorax and abdomen and legs pale reddish-brown. The upper side of the primaries is pale brown, the same color as the thorax, heavily clouded with blackish-brown on the inner margin near the outer angle. There are some obscure annular markings on the cell, a distinct annulus below the cell near the origin of the first median nervule, a blackish V-shaped dash about the middle of the inner margin with the vertex pointing toward the cell, and two straight narrow transverse black lines parallel to each other running from before the apex to the inner margin before the outer angle. The innermost of these lines is the heavier. There is a subtriangular series of fine curved lines on the interspaces. The fringes are dark brown. The secondaries on the upper side are uniformly pale fuscous. On the under side the primaries and the secondaries are uniformly pale brown, and both are crossed by a somewhat broad diffuse transverse median line. Expanse, 32 mm.

149. *N. arctipennis*, sp. nov. ♂. Front, collar and upper side of thorax dark maroon; the upper side of the abdomen dark fuscous; the under side of the thorax and abdomen together with the legs pale rosy-brown. The upper side of the primaries is rich maroon with two obscure annular markings, one on the middle of the cell, and the other at the end, and a submarginal series of darker spots on the interspaces. The secondaries are uniformly dark fuscous. Both wings on the under side are pale reddish-brown and both have very obscure suggestions of diffuse transverse median lines. Expanse, 30 mm. Habitat Benita.

TURNACA, Walk.

150. *T. grisea*, sp. nov. ♂. Tips of palpi whitish; the front, collar, and upper side of thorax and abdomen gray; lower side

of the thorax, abdomen, and legs white. The primaries on the upper side are uniformly gray, irrorated with minute darker scales and marked by a submarginal series of minute white spots punctuated inwardly with minute blackish spots. The secondaries are gray, slightly paler than the primaries. The under side of the primaries is clouded with fuscous except on the costa and outer margins. The under side of the secondaries is white.

♀. The female has the antennae much less strongly pectinated than the male, and the primaries are produced somewhat acutely at the apex. Expanse, ♂, 35 to 37 mm.; ♀, 50 mm.

151. *T. ignobilis*, sp. nov. ♂. Front, collar, and upper side of thorax obscure grayish; upper side of abdomen and lower side of thorax and abdomen whitish. The upper side of the primaries is whitish with an obscure transverse basal and median zigzag line. There is a submarginal series of small black dots on the interspaces. The secondaries on the upper side and the primaries and the secondaries on the under side are uniformly white, shining. Expanse, 38 mm.

RAMESA, Walk.

152. *R. (P) minuta*, sp. nov. ♂. The head, and thorax grayish; the upper side of the abdomen paler gray; the under side of the thorax and the legs dark gray; the under side of the abdomen whitish. The primaries are grayish-white with a number of minute linear dashes on the outer half of the wing and crossed from the base to the middle of the outer margin by a dark blackish ray. The secondaries on the upper side are pale testaceous. On the under side both wings are uniformly testaceous. Expanse, 28 mm.

SCALMICAUDA*, gen. nov.

Palpi small, compressed, heavily scaled, last joint obsolescent. Antennae heavily pectinated for one half the distance from the

base; the culmen simple beyond the middle. The abdomen projects for one-third of its length beyond the hind margins of the wings, and is provided with a long conspicuous brush of anal hairs as in the genus *Ichthyura*. The primaries are elongated, with the costa straight, slightly rounded at the apex, the outer margin straight, the inner margin curved, with the outer angle excised. The secondaries are subpyriform. In the primaries vein 6 is given off beyond the cell; veins 8 and 9 anastomose to near the apex. In the hind wings veins 7 and 8 are stalked, vein 9 runs along the upper edge of the cell. Type *S. bengal*, Holl.

153. *S. bengal*, sp. nov. ♂. Front and collar dark brown; patagia and upper side of thorax and abdomen dark gray; legs brown; under side of abdomen grayish-brown. Primaries grayish-brown traversed by a pale line running from the apex diagonally to the middle of the inner margin, and defined inwardly by dark brown. The area within this line is dark brown contrasting with the lighter area beyond it toward the margin. There is a very fine pale curved sub-basal line succeeded by an annulus on the middle and also at the end of the cell, a similar annulus below the cell at the origin of the median nervule. There are some zigzag narrow submarginal markings shaded inwardly by rusty sagittate spots. The secondaries on the upper side are fuscous. On the under side both wings are pale wood-brown with the basal area of the primaries clouded with fuscous. Expanse, 36 to 40 mm.

MACRONADATA, Moeschl.

154. *M. brunneidorsa*, sp. nov. ♂. Allied to *M. collaris*, Moeschl., from which it differs in lacking the dark spot at the end of the cell of the primaries, and having the middle of the abdomen on the upper side marked by a broad brown longitudinal band. The secondaries furthermore are heavily clouded with dark brown at the base. The

*Scalmus = an oar; cauda = a tail.

transverse lines on the primaries are arranged as in *M. collaris*. Expanse, 60 mm.

I have two specimens which agree thoroughly and differ in the respects mentioned from the insect described and figured by Moeschler. This may be merely a varietal form of his species.

STAUROPOUS, Germ.

155. *S. squamipennis*, sp. nov. ♂. Antennae heavily pectinated, except at the tip of the culmen. Front and collar very dark brown; upper side of thorax and abdomen dark brown; lower side of body and legs paler brown. Primaries dark brown with a broad sooty shade crossing the wings beyond the base. A narrow pale line runs from the costa before the apex to the middle of the outer margin. The wing is ornamented by numerous patches of raised velvety scales of dark brown, margined inwardly and outwardly with pale ferruginous. The fringes are dark brown interrupted with minute white tufts at the ends of the nervules. The secondaries are brown with the costal area marked by three heavy transverse bands of very dark brown. The under side of the primaries and secondaries are pale wood-brown with obscure and diffuse transverse median bands of paler brown. Expanse 38 mm.

LASIOCAMPIDAE.

STIBOLEPIS, Butl.

156. *S. subiridescens*, sp. nov. ♂. Front dark brown; collar and pectus pale creamy; upper side of thorax and abdomen pale fulvous; under side of body creamy; legs creamy with the anterior pair margined internally with dark brown. Primaries on the upper side pale fulvous crossed by waved transverse basal, transverse median, transverse limbal, and submarginal lines, which are produced upon the secondaries. The transverse limbal line is accentuated externally

on both wings by a series of small elongated whitish spots, the most conspicuous being the one nearest the apex, and those nearer the inner margins of the wings. The under side of the wings is uniformly very pale yellowish-brown, lightest at the base. The wings are semi-diaphanous.

♀. The female is much larger than the male. The wings are darker reddish and the median surface on the under side, which is not nearly as heavily clothed with hair as in the male, is most beautifully iridescent, changing in different lights from pale green of brilliant purple. Expanse, ♂, 34 mm.; ♀, 54 mm.

ESTIGENA, Moore.

157. *E. Africana*, sp. nov. ♂. Palpi dark brown; front and upper side of body pale fawn; lower side of abdomen darker brown; the legs pale fawn. The primaries fawn with some paler markings near the base and about the middle of the wing beyond the cell. The end of the cell is marked by a minute discal dot. The secondaries are pale fawn on the inner margin with the costa and the outer margin as far as the middle darker brown. There are three hyaline spots, one at the end of the cell, and two just beyond it at the origin of vein 7. Immediately above these spots toward the costa are four pale yellowish spots with dark brown nuclei. The under side of both wings is marked very much as the upper side. Expanse, 58 mm.

HYPOTRABALA, gen. nov.

♀. Palpi minute, last joint exceedingly small. Antennae relatively small with minute setae. Legs short, hairy. Body stout. Primaries produced at apex, the costa strongly curved beyond the middle; outer margin slightly crenulate, inner margin curved; veins 6 and 7 stalked; vein 8 springing from upper angle of cell. Secondaries suboval, somewhat elongated, with the outer margin slightly crenulate; veins 5 and 6

A CABBAGE-LIKE CECIDOMYIIDOUS GALL ON BIGELOVIA.

BY C. H. TYLER TOWNSEND,
KINGSTON, JAMAICA.

On June 21, 1892, a small bud-like gall was found on *Bigelovia graveolens*. It was quite abundant a few miles to the east of Gallo Spring, N. Mex. There were also found next day, June 22, west of Apache Spring.

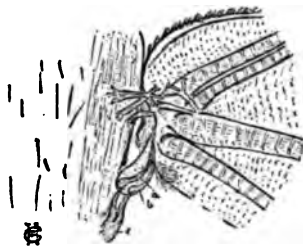
Gall.—Length, 5 to 8½ mm.; greatest basal width, 4 to 7 mm. Small, bud-like, borne on sides of stems, to which the gall is attached by a very constricted base almost without length; formed of loosely overlapping stipules much like the cabbage gall on willow but not conical or compact. Greenish in color, or slightly yellowish, scantily covered with a fine white woolly pubescence. Stipules forming the gall rather broad at base, pointed at end or sometimes rounded, from 12 to 20 in number, but not more than 8 or 10 showing on the outside, the tips of the rest joined and forming the terminal central tip of the gall. Inside the innermost of these, in a little slightly hardened cell, a single larva or pupa is found. Stipules with the woolly pubescence on the outer convex surface and on the edges, nearly or quite bare on the inner concave surface. The central pupal cell is thinly lined with the white woolly pubescence, and is about 3 mm. long, by 1½ mm. wide.

Described from 8 or 9 galls. This species, which is with hardly a doubt new, may be called *Cecidomyia bigeloviae-brassicoides*.

Mr. T. D. A. Cockerell records, on page 106 of vol. vi, West American Sci., the breeding of a cecidomyian from the galls of the trypetid *Eurosta bigeloviae*. If bred from the trypetid galls, it can hardly be the same as this species. He proposes the name *C. bigeloviae* for it, but without description of either gall or insect.

THE CLICK OF AGERONIA.—In a paper on stridulation in certain Lepidoptera pub-

lished by the Zoological society of London Mr. G. F. Hampson gives the first reasonable explanation of the clicking sound produced by *Ageronia*. He says: "On detaching and clearing a fore wing of *Ageronia arethusa*, I found there was a small pyriform membranous sac attached to the base of the inner margin of the fore wing, open anteriorly, and with a pair of curved chitinous hooks with spatulate extremities lying freely in front of it. It was obvious that this could not come



into contact with any of the nervures of the hind wing, and that no structure attached to the hind wing could act on it; and as there seemed to be a projection on the thorax in the immediate neighborhood, I cleared and denuded of scales a half insect with the wings still attached to the thorax, and could then see under a low power of the microscope that there was a pair of strong chitinous hooks attached to the thorax and that when the fore wing was moved up and down the spatulate ends of the chitinous hooks attached to the wing played against these, being released when the wing reached a certain angle, and I suggest that this is the cause of the clicking sound, the hooks acting as a tuning fork and the membranous sac as a sounding board." We owe to the favor of the Zoological society the opportunity to reproduce here his cut illustrative of the mechanism involved.

EARLY APPEARANCE OF ANOSIA PLEXIPUS.—On two very warm days in the early part of May, May 11 and 12, Mr. S. W. Den-

ton saw close at hand a faded but otherwise perfect female of *Anosia plenippus* in the garden of Mr. William Brewster of Cambridge, Mass. It remained for some time about the garden apparently searching for the food plant. This must have been a hibernator and it would seem scarcely possible that it could already have flown from so great a distance as the extreme southern states, but must have passed the winter in some locality somewhat further north. It will be recollected moreover that our last winter was unusually severe. S. H. S.

ATROPHARISTA JURINOIDES. — Professor Townsend mistakes my note in *Psyche*. I did not mean to criticize him for making a synonym — my own house is too vitreous to warrant the free use of such missiles. But he should not be so reluctant to admit in type what he does *in litteris*, that he had overlooked *Melanophrys*. I was in error in regard to the types: Mr. Aldrich tells me that the specimens in his collection which I examined were ones that he had compared with the types. All that I intended in the article referred to was a protest against the indiscriminate use of some of the characters upon which have been founded the hosts of new genera in this family within the past three or four years. S. W. Williston.

Lawrence, Kansas, May 5, 1893.

NOTE ON DR. WILLISTON'S CRITICISMS. — In his article in the March, 1893, number of *Psyche*, Professor Williston does me an injustice. My recent table of tachinidae contains all the genera in Brauer and von Bergenstamm's part i, which are referred by these authors to North America except several which are neither figured nor recognizably described, or else are insufficiently separated from the older genera. None of those in part ii are included, for the reason that not a single one of them is figured, and most of them are extremely difficult to recognize, even with that patient study and ample material commended by Professor Williston. I

do not believe that, in the unbiased entomological mind, genera erected in such fashion can stand. As to the figures that *are* published, and those in part i only, they are with almost no exception heads alone, excellent certainly, but usually there is no clew in the text to the venation. I contend that no amount of patient study and ample material is going to solve such problems *satisfactorily*. I do not accept Professor Williston's proposition that "figures are usually more valuable in this family than extended descriptions." The best of figures are always more or less misleading, and cannot be unflinchingly relied upon. Full and complete descriptions, conscientiously made, are of more value than any number of figures, since they contain information in such a form that it cannot be perverted or misinterpreted, either in the process of publication or afterwards. As to "multiplication of genera," this is the chief fault of the authors upheld, their next fault being the insufficient characterization of those multiplied. It is with the greatest reluctance that I have again referred to the work of these authors, in this particular. I do not "sweepingly condemn" this work. I have great faith in the validity of most of the characters employed by them, though I would not attach the same importance to all. Their figures are unexcelled if equalled, so far as they go. Their descriptions, not their system, are *splendid*, so far as they go!

C. H. Tyler Townsend.

Mar. 12, 1893.

ENTOMOLOGICAL NOTES. — A notable contribution to insect embryology by W. M. Wheeler appears in the last number of the *Journal of morphology*. The original portions of it relate chiefly to Orthoptera and indeed to Locustidae, but the author has investigated many other types including in all some thirty species. Sixty-one figures on the plates represent *Xiphidium*, *Stagmomantis* and *Gryllus*. Seventeen figures in the text are mostly diagrammatic.

Brunner von Wattenwyl has improved the opportunity offered by the study of the large series of Orthoptera collected by Fea in Burmah, to attempt a general revision of the system of Orthoptera by the introduction of tables for the determination of all the known genera (occasionally groups of genera) in the order, excepting only such as have been recently so treated elsewhere, when due reference is made. It will be found exceedingly useful for systematists, for no such general work has appeared since the time of Burmeister and Serville. A considerable number of new genera are thus introduced, and among them not a few of North American forms based sometimes on described, occasionally on undescribed species. The addition of at least a brief diagnosis of such species would have been acceptable. The work forms the first part of v. 33 of the *Annali del museo civico di Genova*.

L. Bruner prints a list of Nebraska Orthoptera reaching the astonishing number of 268 distinct kinds, a testimony to the activity and zeal of the author as well as to the extreme fruitfulness of his field. Brief notes of habitat and abundance accompany each entry (*Publ. Nebr. acad. sc.*, 3).

C. H. Tyler Townsend has left his position as entomologist in the experiment station at Las Cruces, New Mexico, to accept the curatorship of the museum in the Institute of Jamaica at Kingston, W. I., formerly occupied by Mr. Theodore D. A. Cockerell, who, curiously enough, moves to Las Cruces to take Mr. Townsend's place.

The Brussels Museum has begun the publication of a general catalogue of Hemiptera by Lethierry and Severin on the plan of Gemminger and Harold's catalogue of Coleoptera. The first volume embracing the Pentatomidae is promised at an early day. The whole work will probably occupy nine volumes and require five or six years for its publication. Its price will be about one cent a page.

Two new books on butterflies, by S. H. Scudder, have just been published by Henry

Holt & Co., of New York. One is a guide to our common butterflies and describes eighty-four species including (with only half a dozen exceptions) the caterpillar and chrysalis as well as the butterfly of each, besides tables to determine them in every stage. Brief biographies of each species are given and at the beginning there is a general introduction to the study of butterflies. The other is a very full account of the life of a butterfly for general readers, our milk-weed butterfly being the central figure.

• The Western university of Pennsylvania has just conferred the degree of D. Sc. on Frederick Moore and of Ph. D. on A. G. Butler, both of London, in recognition of their work in entomology.

The West African moths figured in this number illustrate Dr. W. J. Holland's article. They are as follows: *Plate 17. Fig. 1.* *Ilema gonophora*; 2. *I. albibasalis*, ♀; 3. *I. miserata*; 4. *I. circumdata*; 5. *I. albicosta*; 6. *I. flava*; 7. *I. albospargata*; 8. *I. apicata*; 9. *I. diluta*; 10. *I. brunneicosta*; 11. *I. pallida*; 12. *I. fusca*; 13. *Argila affinis*; 14. *Nioda nigristriata*; 15. *Argila basalis*, Wlk., ♀; 16. *Nioda agrotoides*; 17. *N. erubescens*; 18. *Somera chloauchena*; 19. *S. chloana*; 20. *S. desmotis*; 21. *S. chloromorpha*; 22. *S. chloëropis*; 23. *Desmeocraera hinnula*; 24. *Somera bitoides*; 25. *Olene costiplaga*; 26. *Olene hyloica*; 27. *Notohyba viridis*; 28. *N. atrata*; 29. *Somera infima*, ♂; 30. *S. infima*, ♀; 31. *S. falsa*; 32. *Turnaca grisea*; 33. gen. (?) sp. (?). *Plate 18. Fig. 1.* *Dasychira apateloides*; 2. *D. nubifera*; 3. *Notohyba nubifuga*; 4. *N. delicata*; 5. *Notopriota ocellifera*; 6. *Notohyba proletaria*; 7. *Thamnocera albilinea*; 8. *Hypotrabala castanea*; 9. *Metanastria porphyria*; 10. *M. spargata*; 11. *Stibolepis subiridescens*; 12. *Lebedodes cossula*; 13. *Dasychira variegata*; 14. *D. albosignata*; 15. *Oecura crucifera*; 16. *Cyrtogone lichenodes*; 17. *Estigena Africana*; 18. *Orgyopsis tenuis*; 19. *Terphothrix lanaria*; 20. *Aroa omissa*.

No. 14, p. 476, should read *S. chloëropis*.

PROCEEDINGS OF SOCIETIES.

CAMBRIDGE ENTOMOLOGICAL CLUB.

10 March, 1893.—The 177th meeting was held at 156 Brattle St. Mr. S. Henshaw was chosen chairman and Mr. H. G. Dyar secretary.

Mr. S. H. Scudder directed attention to a passage in his *Butterflies of the Eastern United States*, where he had questioned whether *Tropaeolum* was one of the food plants of *Pieris rapae*, as he thought there might be a confusion from the fact that the caterpillar fed upon the genus *Nasturtium* which was the common name of *Tropaeolum*; but he

read a letter from Mr. H. B. Fletcher of England who assured him that he had found the eggs and caterpillars on two species of *Tropaeolum*, one of the Geraniaceae.

Mr. Scudder also exhibited numerous specimens of *Schistocerca literosa* Walk., from the Galapagos Islands and showed the differences between the races inhabiting three distinct islands. In some further remarks upon the orthoptera of the Galapagos, he said that the paucity of species and their character in no way supported Baur's notion that these islands formed part of a sunken continent, but decidedly indicated a recent accidental fauna.

JUST PUBLISHED.

Scudder's Brief Guide to the Commoner Butterflies.

By SAMUEL H. SCUDDER, author of "*Butterflies of the Eastern United States and Canada*," etc. xi + 206 pp. 12mo. \$1.25.

An introduction, for the young student, to the names and something of the relationship and lives of our commoner butterflies. The author has selected for treatment the butterflies, less than one hundred in number, which would be almost surely met with by an industrious collector in a course of a year's or two year's work in our Northern States east of the Great Plains, and in Canada. While all the apparatus necessary to identify these butterflies, in their earlier as well as perfect stage, is supplied, it is far from the author's purpose to treat them as if they were so many mere postage-stamps to be classified and arranged in a cabinet. He has accordingly added to the descriptions of the different species, their most obvious stages, some of the curious facts concerning their periodicity and their habits of life. A short introduction to the study of butterflies in general is prefixed to the work, and is followed by a brief account of the principal literature of the subject.

Scudder's The Life of a Butterfly. A Chapter in Natural History for the General Reader.

By SAMUEL H. SCUDDER. 186 pp. 16mo. \$1.00.

In this book the author has tried to present in untechnical language the story of the life of one of our most conspicuous American butterflies. At the same time, by introducing into the account of its anatomy, development, distribution, enemies, and seasonal changes some comparisons with the more or less dissimilar structure and life of other butterflies, and particularly of our native forms, he has endeavored to give, in some fashion and in brief space, a general account of the lives of the whole tribe. By using a single butterfly as a special text, one may discourse at pleasure of many; and in the limited field which our native butterflies cover, this method has a certain advantage from its simplicity and directness.

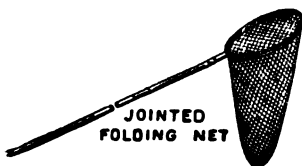
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PSYCHE.

THE PRIMITIVE NUMBER OF MALPIGHIAN VESSELS IN INSECTS.—III.

BY WILLIAM MORTON WHEELER, PH.D., CHICAGO, ILL.

ORTHOPTERA. It is in this order that we first meet with facts having a decided bearing on the question under consideration. I have no data on the embryology of the Phasmidae and Mantidae.* The other families may be taken up in order.

BLATTIDAE. In the embryo *Phyllo-dromia germanica* I find four Malpighian vessels which arise as discrete outgrowths of the hind-gut in the manner so often described for other insects. Somewhat later two more vessels are added. The adult *Phyllo-dromia* and *Periplaneta orientalis* have 60–70 vessels according to Schindler† and Miall and Denny.‡ Hence a great increase in the number of tubules must take place during larval life. That this is the case was shown by Schindler,§ who found only 16–18 vessels in a larval *Periplaneta* not quite 10 mm. long, and only eight vessels in larvæ measuring 4–5 mm. Notwithstanding this increase in the number of vessels, the number

(6) persists throughout life, since, as Miall and Denny* have shown, the vessels of the adult are grouped in six clusters at the anterior end of the strikingly hexagonal rectum.

LOCUSTIDAE. In the embryo *Xiphidium ensiferum* four Malpighian vessels arise as in Blattids; to these a third pair is soon added. In the adult, of which I examined four specimens, the vessels are inserted in six clearly defined clusters, each containing about 7 or 8 tubules. Hence there can be no doubt that in this form also the number of vessels increases during larval life. This increase is probably effected by a budding out of new vessels from the proctodaeal wall at the bases of the embryonic vessels. A large adult *Orchelimum* which I examined showed the same arrangement of Malpighian vessels as *Xiphidium*.

Other writers have observed the clustered arrangement of the excretory tubules in the Locustidae but they fail to find six clusters. According to Leon Dufourt† the 10–12 vessels of *Ephippigera* open into the gut on five sepa-

* Leon Dufour. *Recherches sur les Orthoptères* etc., p. 358, claims the number of Malpighian vessels in the adult Mantis to be "une centaine environ."

† l. c. p. 607.

‡ The structure and life-history of the cockroach (*Periplaneta orientalis*) London, 1886, p. 128.

§ l. c. p. 607.

* l. c. 123.

† l. c. p. 350.

rate knob-like projections. According to Schindler,* *Locusta viridissima* has more than 100 vessels; "sie münden zwar bei *L. viridissima* einzeln in den anfangstheil des dünndarms ein, haben sich aber dabei—entsprechend dem familiencharakter—deutlich in 4 oder 5 ziemlich umschriebene büschel gruppiert." Schindler† also studied *Decticus verrucivorus*. "Die absonderung dieser organe in einzelne (vier) büschel ist bei *Decticus* weniger auffallend, als bei *Locusta*." I venture to conclude either that Dufour and Schindler have overlooked one or two of the clusters of vessels or, what is more probable, that the forms which they studied presented a fusion of two or more of the primitive clusters.

GRYLLIDÆ. The Malpighian vessels of this group present a very aberrant character; most, if not all, the forms having in their adult condition a great number of tubules opening into the rectum by means of a single long duct. Schindler‡ estimates the number of vessels in *Acheta campestris* at about 100.

Rathke§ studied the embryonic conditions in *Gryllotalpa* and found that the embryo leaves the egg with only four vessels, which, even at this time, are connected with the proctodæum by means of a single duct. Soon another pair of vessels is added, so that we really have a stage with six vessels, albeit

united in a single cluster. More vessels are acquired from time to time during larval life, till the imaginal number is completed.

Oecanthus niveus apparently presents more primitive conditions. Ayers,* who studied the embryology of this insect, makes the following statement. "When the tube (proctodæum) has elongated so that its enlarged end lies within the fourth or fifth segment of the abdomen (counting from behind forwards) there arises near the free end in the median dorsal line a small trilobed, hollow bud of the ectodermic layer, opening into the lumen of the tube. Each lobe grows rapidly into a small tubular organ, the primitive Malpighian vessel. Each of these bifurcates at some distance from the proctodæum, so that there are ultimately six of the tubes." This account certainly tends to show that in some Gryllids 3 and 2 are combined in the primitive number. The common duct seen in *Gryllotalpa* and *Acheta* and indicated in the embryo *Oecanthus* may, I believe, be safely regarded as a secondary development, since it occurs in no other group of Orthoptera and but very rarely appears in other orders.

ACRIDIDÆ. The numerous Malpighian vessels in this family resemble those of the Locustidæ but are not arranged in clusters. In the embryo *Melanoplus femur-rubrum* I find only six vessels, originating simultaneously in three pairs.

* l. c. 619.

† l. c. p. 621.

‡ l. c. p. 616.

§ Zur entwicklungsgeschichte d. maulwurfsgrille. Müller's archiv. 1844, p. 27, taf. ii, fig. 435.

* On the Development of *Oecanthus niveus* and its parasite *Teleas*. Mem. Bost. soc. nat. hist. vol. iii, 1884, p. 246.

NOTES ON GLUPHISIA AND OTHER NOTODONTIDAE.—I.

BY A. S. PACKARD, PROVIDENCE, R. I.

This paper is mainly based on examinations of the types of the late Henry Edwards, now preserved in the American Museum of Natural History; and for facilities and courtesies I am indebted to the curator of entomology, Mr. W. Beutenmüller.

I regard *Gluphisia* as the simplest and most primitive genus of the group; its larva being noctuiform and without any projections. The larvae are often, perhaps usually, even, without any red spots. *G. trilineata* Pack. is the typical species.

G. RIDENDA Edw. is very closely allied, representing *G. trilineata* in Colorado. The Edwards' collection contains three ♂. I have a ♀ from Colorado which I compared with Mr. Edwards's type specimen before his death. Its venation is the same as in *G. trilineata*; its body and wings are paler gray, the broad median band on the fore wings is clearer, and pale tawny yellowish. It is not improbable that *C. ridenda* will ultimately prove to be merely a climatic variety of the eastern *trilineata*.

G. RAPTA Edw. 1 ♀, Colorado, I regard as a variety which should be united with *G. ridenda*. The single (type) specimen is a ♀, without antennae or abdomen.

It is of the same size and with the same shape of wings as in *G. ridenda*. Head and

prothorax paler than in *G. ridenda*. Fore wings pale gray, as pale as in *ridenda* and whiter than in *trilineata*; base of wings pale, with a black longitudinal streak, a little oblique on the costa, and behind is a diffuse black irregular band; the inner line is black, and as in *ridenda*. The inner black line forming the inner border of the luteous or tawny yellowish median band is very distinct, oblique, not bent outward as in *ridenda*. The band is much narrower than in *ridenda*, the outer and inner black lines nearly meeting on the inner edge of the wing. The outer line is not so much bent on the costa. No middle line present. *The space beyond the narrow pale line just beyond the outer line is dusky*, much as in *trilineata*, where it is pale in *ridenda*. Submarginal scalloped line not so near the edge of the wing as in *ridenda*. Fringe checkered as in *ridenda* and *trilineata*. The hind wings are as in *ridenda*, with no transverse line. Beneath as in *G. ridenda*, but with a broad dusky cloud on the outer fourth of the fore wings, not reaching the edge.

G. ALBOFASCIA Edwards.—The 2 ♂ type specimens are from Utah, and seem to be only a pale form of *G. ridenda*, probably due to its living in a drier, less rainy, more sunny region. It is to be noted that the western varieties named have no longer fore wings than in the eastern *trilineata*. It seems to be identical with *G. formosa*, but scarcely separable from *G. ridenda*, being, with little doubt, a climatic variety of the latter species. The two ♂ marked *albofascia* resemble *G. for-*

mosa, only the nearly clear spaces of the latter in *albofascia* form dark, broad, very distinct bands. There are two dark dusky patches on the hind wings. The examples of *G. albofascia* are more typical of the species (if it be regarded as distinct from *ridenda*) than those placed under *G. formosa*.

The fore wings somewhat luteous-gray at base; on the inner third is a broad black band widening on the costa, and still wider on the internal edge, where it reaches a little beyond the middle of the wing. A clear luteous gray median space, beyond which on the outer third of the wing is a broad black band, between which and the submarginal scalloped line is a gray band. Hind wings with a diffuse broad band on the outer fourth, forming a dark patch on the internal angle, and another in the independent interspace. On the under side of the wings the dark bands show through, as do the two dusky spots on the hind wings.

G. FORMOSA Edwards.—4 ♂, all from Utah. As already stated I regard this as a synonym of *G. albofascia*, both species being with little doubt climatic varieties of *G. ridenda*.

The antennae are well pectinated, rather more so than in *G. ridenda*. The wings are much paler gray than in *ridenda*, the hind wings being almost white, but the thorax and abdomen are as in *ridenda*. Fore wings with black scales at the base, but with no definite lines such as are to be seen in *trilineata* and *ridenda*, but just beyond the base the wing is more or less luteous, as in *ridenda*. Middle of the wing with a broad pale flesh-colored or luteous band, bordered on the inside by a very distinct black line like that of *ridenda*, becoming wider on the costa. In the middle of the band is a dark line nearly parallel with the inner one, dilat-

ing on the veins and all the lines forming distinct dark costal spots. The outer third of the wing gray, with dark scales and with an irregular blackish wavy line, much as in *ridenda* and *rupta*. Hind wings whitish, with no lines, and with three dark dots on the fringe of the internal angle. The outer third of the wing faintly dusted more or less with fine dark scales. Wings pale whitish beneath; two blackish costal spots beyond the middle, and costa of both wings speckled with dark scales. A faint diffuse band passes across the hind wings just beyond the middle; and the margin of both wings is speckled with dark scales. Body beneath pale, and the legs (tarsi) ringed with dark scales.

After preparing the preceding descriptions I find that Mr. Edwards adds to his description of *G. formosa* the following remark: "It is possible that *G. ridenda* and *G. rupta* are forms of one species, and that *G. albofascia* and *G. formosa* are forms of another, but I prefer to consider them as distinct until future investigation shall determine their true position."

G. LINTNERI (Grote). Originally described as a *Dasychira*; this is a true *Gluphisia*, but, with *G. severa* and *avimacula*, belonging to a distinct section of the genus. The ♂ antennae are provided with long close pectinations; the body is stout and hairy; the costa of the fore wings is much more convex than in *G. trilineata*, and the apex somewhat produced as in *G. severa*.

G. WRIGHTII H. Edwards, Ent. amer. ii, 11. April, 1886. This species inhabits San Bernardino, Cal. It is very near *G. severa* Edwards (Ent. amer. ii, 167. Dec. 1886).

Of the two female specimens placed under *G. severa* in the Edwards collection, one (not the type, which is a ♀ from Soda Springs, Cal., April 15, with eggs), probably added after his description was published, I regard as a specimen of *G. wrightii*. Its locality is Sierra Nevada, Cal. (and Mr. Beutenmüller suggests that it may have been taken at Mt. Shasta). The specimen is perfectly preserved, and in its structural character is closely allied to *G. severa*. The thorax has a median tuft as in *G. severa*. From the type of *wrightii* it differs in the more distinct and darker markings, being less rubbed.

A decidedly luteous subtriangular spot extends from the base of the wing to the inner distinct line crossing the wing, which line is situated half way between the base of the wing and the inner side of the median band, this line having been rubbed off in the type of *wrightii*. The space between this line and the median band is whitish gray. The broad blackish median band encloses a sinuous linear luteous discal spot, and there is a luteous patch near the internal edge of the wing. The inner edge of the median band is less distinctly sinuous than in the type of *wrightii*, and so is the white outer bordering line, which, however, is more zigzag. The edge of the wing is stone-gray, as in the type of *wrightii*, and encloses the usual scalloped dark line, as in the type of *wrightii*. Hind wings as in the type; a diffuse dark band crosses the wing beyond the middle, and a second outer one is parallel to it, but does not reach the middle, and the two bands enclose a white linear spot, as in the type.

As the species occurs in northern as well as southern California, and is quite

variable, *severa* may have to be united with it.

G. SEVERA Edwards. The single type is a ♀ from Soda Springs, Cal.

The type is much larger than the Sierra Nevada specimen, and well preserved. Antennae with short pectinations. Body and head dark gray. Wings unusually dark; fore wings dark gray on the basal third, with a very small luteous spot on the median and submedian veins. Median band broad and dark, almost black, and not bordered by the narrow scalloped outer line, the wing being suffused with black to the outer edge. A narrow faint luteous linear discal spot. Half way between the scalloped pale gray line and the outer edge of the wing is a submarginal series of tawny or luteous patches. Hind wings just as in the Sierra Nevada example, and venation as in *wrightii*. Wings underneath dark and much diffused, the line on the fore wing less sinuous than in the *wrightii* type. Hind wings with two parallel broad dark bands, just as in the Sierra Nevada specimen of *G. wrightii*. The shape of the head and the wings is the same in the Californian *severa* and the eastern form. In both forms the hind wings are nearly the same.

I am indebted to Mrs. Annie Trumbull Slosson for the privilege of examining and describing a single remarkable specimen in a perfect state of preservation taken at Franconia, N. H. Mrs. Slosson, unlike many entomologists, has kindly allowed me to partially denude the under side of the wings of her unique specimen, so that the venation could be carefully drawn with the aid of the camera. She has determined the species to be new. The species was not to be found in the collections of Mr. Graef, Mr. Neumogen, and Mr. Beuten-

müller had not seen it in the Henry Edwards collections, now fortunately in the possession of the American Museum of Natural History at Central Park, New York. I had described the form as *Ceruridia slossoniae*, regarding it as the type of a new genus, allied to but distinct from *Gluphisia*, owing to the notable differences in the venation, as well as the presence of a dorsal tuft, and other characters given below. After sending my description for publication Mr. Dyar wrote me that he had seen the specimen with my name on it in Mrs. Slosson's collection, and that it seemed to him to be a dark ♀ of *Gluphisia avimacula* Hudson, adding that Mr. Neumogen's "*Melia danbyi*" is referable to the same genus, but his name "*Melia*" is preoccupied. Mr. Dyar then rather hastily and with over zeal published my name. Since then I have re-examined Edward's type of *G. severa*, and have received from Mr. Dyar a specimen of *G. lintneri*. Mr. Dyar also wrote me as his opinion that the species of *Ceruridia* or *Melia* (*Eumelia*) are not generically different from *Gluphisia*, as he has collected *G. severa* in the Yosemite Valley, Cal.

As the result of my studies, especially of the venation, I am inclined to divide the genus *Gluphisia* into two sections and to believe that in the forms mentioned below we have a number of climatic or temperature varieties of a species allied to *G. lintneri* (originally referred to *Dasychira* by Grote), and which is common to both the Atlantic and Pacific coasts. The syn-

onymy may then eventually prove to be somewhat as follows:—

GLUPHISIA WRIGHTII H. Edwards, Ent. Amer. ii, 11. April, 1886.

Gluphisia severa H. Edwards, Ent. Amer. ii, 167. Dec. 1886.

Melia danbyi Neum. Can. Ent. xxiv, 225, 1892.

Eumelia danbyi Neum. Can. Ent. xxv, 25, 1892.

Gluphisia avimacula Hudson, Ent. News. ii, No. 8, 155. Oct. 1891.

Of all these forms the variety *slossoniae* is the most remarkable, from its very dark markings, and deserves to receive a distinct name. That these forms may be the result of climatic causes, acting on the insect in its pupal state, seems pretty well established from the remarkable results obtained not only by Weismann and W. H. Edwards, but also the more detailed experiments made by Mr. F. Merrifield and published with elaborate plates in the Transactions of the entomological society of London for 1891 (p. 155) and 1892, 33, (xxxvi).

In comparing *G. slossoniae* with Hudson's description of *avimacula*, it seems most probable that it is a melanotic form, due to the colder and damper situation of Franconia, N. H., which is about 1400 feet above the sea. In *slossoniae* the thorax is lighter, the pale ochreous basal and discal spots of *avimacula* are whitish gray in *slossoniae*, and the basal and middle lines of the median band are swamped by the broad black-brown band of *slossoniae*; the hind wings of *slossoniae* agree with Hudson's description of *avimacula*.

A DESCRIPTION OF THE LARVA OF A SPECIES OF THE
LINTNERI GROUP OF GLUPHISIA.

BY HARRISON G. DYAR, BOSTON, MASS.

GLUPHISIA SEVERA Hy. Edw.

1886—H. Edwards, Ent. amer., ii, 167.

Egg (♀). Hemispherical, the base flat; smooth, slightly shiny whitish green, the micropyle round, small, black. Under a half inch objective it is seen to be covered with irregular flattened reticulations, not raised above the surface of the egg, much as in *Cerura*, but more irregular, ranging in shape from quadrilateral to hexagonal. Diameter 1.1 mm. Found on a poplar leaf, deposited singly. I am not sure that this egg belongs to this species, as it failed to hatch, but it was found with the larvae and probably belongs here.

First larval stage. Not observed.

Second stage. Head slightly bilobed, not shiny, pale green; mouth whitish; ocelli black; width 0.9 mm. Body smooth, slender, without humps or tubercles, uniform pale green, not shiny, with a faint yellow subdorsal line. No other markings.

Third stage. Only the cast head case was observed, the width of which was 1.45 mm.

Fourth stage. Width of head, 2.3 mm. Much as in the first part of the last stage. There is a moderately distinct, pale yellow, subdorsal line without other markings, or else traces of lateral and stigmatal yellowish lines, the former broken, the latter continuous, but faint. Spiracles small, faintly ochereous. As the stage advances the stigmatal line becomes the most distinct, the others becoming faint.

Fifth stage. Head very slightly bilobed, somewhat flattened in front, uniform pale, sublustrous green, mouth parts paler, jaws black; width 3.5 mm. Feet normal, all used in walking, concolorous with the body, the claspers whitish. Body long and slender,

noctuidiform in appearance, without humps or tubercles; piliferous dots absent, the hairs being reduced to mere rudiments. Color uniformly non-lustrous pale green, semi-transparent, showing plainly the pulsations of the dorsal vessels. An obscure, pale yellow, stigmatal line. Spiracles dull ochre. The larva rests on a slight web on the back of the leaf, the head held out flat.

As the stage advances the markings become much more pronounced. The head is mottled with white, especially on each side of the clypeus; clypeus white centrally; a yellow line appears on the side of the head from the base of the antennae behind the ocelli, in line with the stigmatal band when the insect is in its normal position of rest. Stigmatal line distinct, pale yellow, bordered above, very narrowly, with crimson on the thoracic segments, and reaching nearly to the end of the anal plate. Dorsal region whitish green, becoming almost white; subventral region clear green, with yellow dots; spiracles orange, feet faintly tipped with vinous. There are faint traces of a yellowish subdorsal line, and one on each side of the dorsal vessel, but they become white and are seen as somewhat more distinct parts of the general whitish dorsal shading. Still latter, the rudimentary piliferous dots become surrounded with yellow. There are seven on each side above the stigmatal line, seven in the subventral space (where they appear more distinctly on account of the absence of white shading) and others on the venter of the legless segments.

Length of larva, 41 mm. at maturity.

Cocoon. Spun among leaves. It is composed of gummy silk, slight, but tough.

Pupa. Nearly cylindrical, rounded, no

cremaster; abdomen punctured, cases coarsely creased: color uniform dark brown, nearly black. Length 17 mm.; width 6 mm.

Food-plants. Poplar (*Populus tremuloides* and *P. balsamifera*). Larvae from Yosemite, Cal.

♂ moth. Allied to *Gluphisia lintneri* Grote and *G. avimacula* Hudson. Antennae lengthily bi-pectinated, the pectinations black, with dense, pale ciliae; shaft with whitish hairs. Thorax and abdomen densely clothed with dark gray hairs, black and white mixed, much darkest on thorax, the posterior edge of the collar defined by a paler line. Wings dark gray, nearly white scales intermixed with black scales and hairs, the white predominating in the median space. At the base of fore wings, on median vein, is a small ocherous dot, contiguous to, and forming part of a basal ocherous shading, enclosed in the space between median and internal veins, and bordered outwardly by an obscure, brownish-black, transverse line. Sub-basal space gray, clothed with black and white scales becoming lighter just before the t.a. line. Transverse anterior line distinct, velvety black, outwardly produced on subcostal, median and internal veins and inwardly arcuate across the cell and submedian interspace, most strongly defined at the internal margin. Median space broad, pale gray, with a central blackish shade-line in which is an obscure ocherous crescent at end of cell. Space below median vein next to t.a. line also shaded with ocherous, extending to the t.p. line along internal margin. The veins are slightly lined with black. Transverse posterior line whitish, dentate, preceded and followed by a black shade which is emphasized by the black markings on all the veins before the line, and fills in the subterminal space outside of it. Subterminal line outwardly arcuate to vein 4, thence again strongly arcuate to the interspace between veins 2 and 3 and thence straight to internal angle. It is shaded with ocherous yellow and bordered outwardly with dark brown;

but is narrowly broken on each vein by the gray ground color. Terminal space even, dark gray; fringes spotted with white and blackish brown. Hind wings thinly scaled, dark gray, paler at base, with two transverse pale lines defined by black scales and, on the internal angle, by three distinct black spots, the lower one of which is on the fringe. The outer line is faint, but is tinged with ocherous at the anal angle. Fringe as on fore wings. Beneath, blackish gray; a common extra mesial pale band, bordered inwardly with black. Hind wings whitish centrally. Expanse of wings, 41 mm.

Mr. Neumoegen has recently proposed the name *Melia** (which, however, is preoccupied) for the lintneri group of *Gluphisia*, describing as the type *M. daubyi*. This is the form of *Gluphisia severa* found in the Northwest, and I do not think it specifically distinct from that which occurs in the Sierra Nevada. I have taken it at Portland, Oregon, and have seen two examples in the collection of Mr. R. H. Stretch, presumably captured in Seattle, Wash.

A COCKS-COMB GALL ON RHUS MICROPHYLLA.

BY C. H. TYLER TOWNSEND,
KINGSTON, JAMAICA.

On June 16, 1892, I found a gall of very striking appearance, from its deep scarlet color, on *Rhus microphylla*, near Mud Spring, which is on the road between Las Palomos and Cuchilla Negra, in Sierra county, N. Mex. The gall is of peculiar shape and resembles a cluster of many thickened leaflets massed together. At a casual glance, it might be mistaken for the fruit of the *Rhus*, which is in clusters and orange-colored but very different in form. The same gall was found next day, June 17, in the upper portion of the small cañon known as the Cañada Alamosa.

* Can. ent. xxiv, 225.

Gall.—Average diameter, 15 to 25 mm; length (on twig), about 20 to 30 mm. Galls luster-like, irregular in shape, sometimes, rounded, cocks-comb-like in appearance, springing from the small stems which shoot out laterally from the twig or branch, or terminal portion of latter. Consisting of irregular massed clusters of many aborted, deformed, greatly thickened and fleshy leaflets springing from the side stems; surrounding the twig or branch but not attached thereto, dark scarlet-red in color on all surfaces exposed to the sun, the under side when not so exposed being annually greenish and always lighter than the upper or exposed portions. Inside portions green. External surface of the gall extremely irregular in outline, the fleshy leaflets arranged in irregular cocks-comb-like groups more or less pointed apically, the groups of leaflets longitudinally creased, appearing as though formed of many little columns set side by side and soldered together, much resembling groups of certain columnar crystals.

Described from 3 or 4 galls. The fleshy groups of leaflets contain irregular cavities within them. These, when opened the following spring, revealed only small pale brownish bodies attached to the walls inside. I am unable to suggest the order of insects to which the maker of this gall belongs. It may possibly be an acarid—perhaps a phytoid.

TARDY WING-EXPANSION IN CALLOSAMIA.—A few days ago I found, in Kensington, N. H., a small wild-cherry tree hung with cocoons of *Callosamia Promethea* to the number of seventy-five at least. On some twigs six or seven hung close together, all unusually large and light-colored. I cut off over thirty of them, and on June 12th I opened them, finding all good but one, in which the pupa had failed to cast the larva-skin, and so had died. One cocoon contained a ♀ on the point of emerging, the pupa-skin being broken in several places. I took out the half-emerged moth, removed

the ragged pupa-skin, and the moth crawled to the top of my cage, and hung there, undeveloped, all day and all night. This morning, June 13th at nine o'clock, its wings were still undeveloped, and I supposed it had been stunted by the unusual mode of emergence. At ten o'clock, however, the wings had expanded to nearly full size, and in half an hour more the moth was a fine specimen, fully developed, and unusually large!

I have never known the wings to expand so many hours after the moth had emerged.

Caroline G. Soule.

Brookline, Mass.

ENTOMOLOGICAL NOTES.—Insect parasitism is admirably and suggestively treated in Pres. Riley's address to the Entomological society of Washington, just printed in its proceedings. It is worthy of the closest attention as a broad outline of the subject; by the introduction of fuller illustrative details it could easily be expanded into a volume and be a very welcome addition to our literature.

In the last part of the transactions of the Entomological society of London, Dr. David Sharp shows that ants stridulate by means of fine transverse lines on the middle of the dorsum of the third abdominal segment where it is rubbed by the edge of the preceding segment; these organs are usually present in the Ponerides and Myrmicides, but appear to be absent from the Camponotides and Dolichoderides.

A. D. Hopkins prints in Bull. 31 of the West Virginia experiment station an interesting Catalogue of West Virginia Scotytidae and their enemies.

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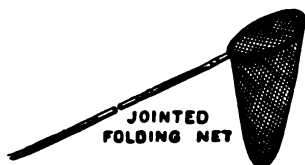
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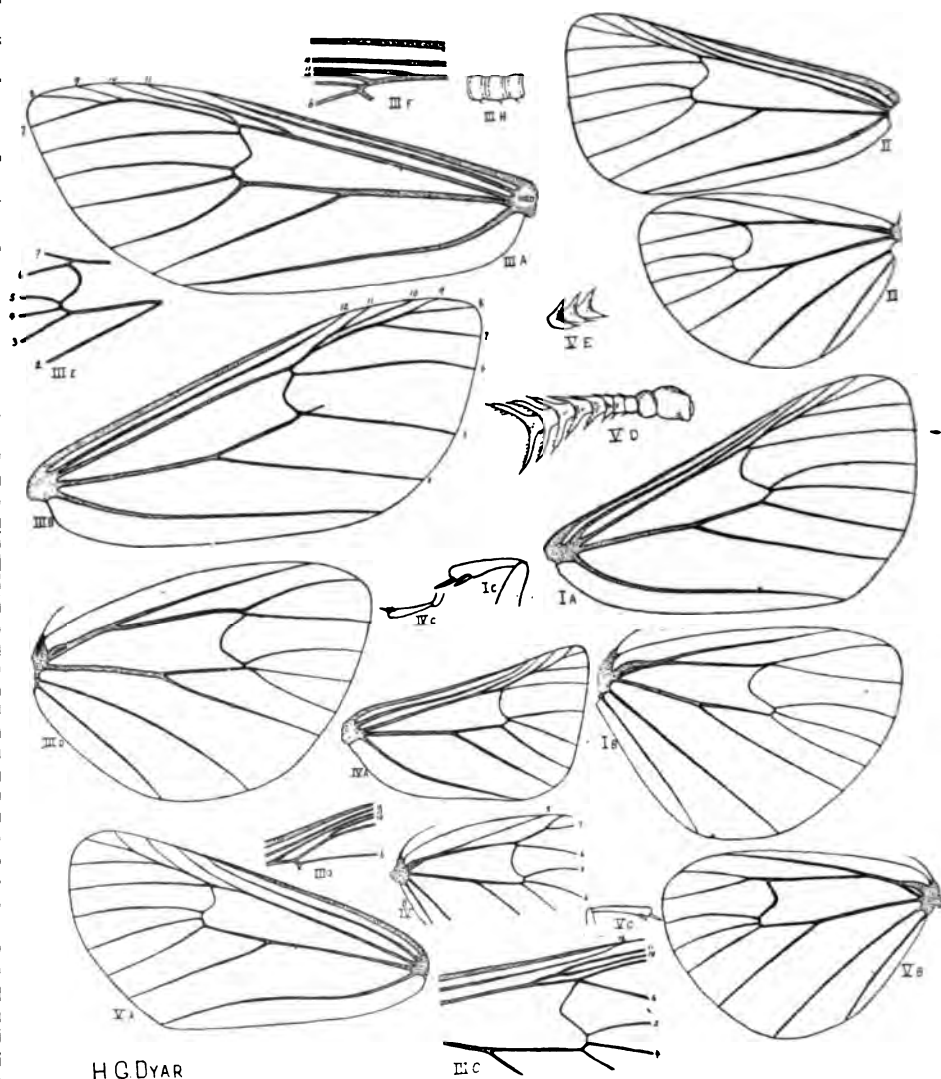
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PSYCHE.

THE PRIMITIVE NUMBER OF MALPIGHIAN VESSELS IN INSECTS.—IV.

BY WILLIAM MORTON WHEELER, PH.D., CHICAGO, ILL.

EPHEMERIDEA. Schindler* estimates the number of Malpighian vessels of *Ephemeridea vulgata* at about 40. I have examined the nymphs of three species of Ephemeridea belonging to the genera *Blasturus* and *Ecdyurus*. In one the vessels open separately into the gut; while in the two others they are distinctly ramified. An older nymph of one of these species had about 12 primary trunks, whereas in two much younger specimens there were only 8. In all three species the vessels were coiled and much enlarged at their tips, so that the whole mass resembled a chevaux-de-frise. Schindler found similar conditions in *Ephemerella flavipes*. I believe that the eight primary trunks in the young Ephemerid represent in great part primitive vessels. The still younger larva or the embryo probably has only 4 or 6 simple diverticula of the hind-gut.

ODONATA. Nothing is known concerning the embryonic Malpighian vessels in this order. Schindler† found

50–60 vessels in imàgines of *Libellula flaveola*, *L. depressa*, *Aeschna grandis*, *Calopteryx splendens* and *Agrion puella*. It is more than probable that the larvae and embryos have a much smaller number.

PLECOPTERA. *Perla bicaudata* according to Schindler* has 50–60 vessels. I have been unable to secure embryos of this interesting order. It is certain, however, that the larvae must hatch with very few vessels, since a 5 mm. black and yellow Perlid larva, not uncommon under stones in rapid brooks near Worcester, Mass., had only 14 vessels. The nearly mature nymph of the same species (16 mm. long) had more than 50.

CORRODENTIA. Lespes† found 8 Malpighian vessels in *Termes lucifugus*. Fritz Müller‡ found 6 or 8 in *Calotermes* and “bei vielen arten von *Termes* und ebenso bei *Eutermes* und

* l. c. p. 623.

† l. c. p. 626.

* l. c. p. 625.

† Recherches sur l'organisation et les moeurs du Termite lucifuge. Ann. sci. natur. 4. sér. zool. v. 1856.

‡ Beiträge zur kenntniss der Termiten. Jen. zeitschr. bd. ix, 1875.

Anoplotermes bleibt die zahl der harngefäße zeitlebens auf 4 beschränkt." According to Nitsch* Psocus has 4 urinary tubules and authors ascribe the same number to the Mallophaga, according to Schindler.† Thus, although the number 6 occurs among the Corrodentia, the number 4 appears to be the more typical.

THYSANOPTERA. In his admirable anatomical monograph of this order, Jordan‡ ascertains the number of Malpighian vessels to be 4; 2 extend into the thorax, while the remaining pair lie coiled in the abdomen.

RHYNCHOTA. In Aphides Malpighian vessels were not seen by Schindler.§ Nor do I find any mention of these organs in Will's embryology of the viviparous forms.|| Leydig¶ found a single pair of vessels in the Coccid *Lecanium hesperidum* and Mark** demonstrated

their occurrence in other species of the same group.

All other Rhynchota have 2 pairs, which show some interesting variations, tabulated by Schindler.* In most genera the vessels end blindly, but in others (Nepa, Velia, Gerris, Capsus, Cimex) the ends of the pairs are united in loops. In some genera (Psylla, Cicada, Nepa) the four vessels open separately into the intestine; in others (Pediculus, Cixius, Capsus, Pentatoma), either pair has but a single duct. Frequently the common ducts are swollen into vesicles (Velia, Gerris, Lygaeus, Pentatoma, Cimex).

The union of vessels both at their distal and proximal ends is undoubtedly a secondary feature. In the embryos of *Cicada septendecim* and *Zaitha fluminea* I fail to find any union; the vessels arise as four discrete diverticula.

It is more than probable that 4 is the original number of Malpighian vessels in the Rhynchota. The Coccidae and Aphidae, the former with 2, the latter without vessels, have lost one or both pairs. That such is the case is shown by the Coccid *Orthezia cataphracta*,† which still retains 2 pairs.

* Über die eingeweide der bücherlaus, etc. Mag. f. entomol. iv, 1821, p. 277.

† l. c. p. 604.

‡ Anatomie und biologie der Physapoda. Zeitschr. f. wiss. zool. bd. 47. 1888, p. 576 and 578.

§ l. c. p. 639.

|| Entwicklungsgeschichte der viviparen Aphiden. Spengel's Zool. jahrb. abth. f. anat. u. ontog. bd. iii, 1888.

¶ Zur anatomie von Coccus hesperidum. Zeitschr. f. wiss. zool. bd. v. 1854, p. 3.

** Beiträge zur anatomie u. histologie der pflanzenlaus insb. der Cocciden. Inaug. dissert. 1876 p. 52 et seq.

* l. c. p. 640.

† *Orthezia cataphracta*, eine monographie. Zeitschr. f. wiss. zool. bd. 45, 1887.

ON VARIATION IN THE VENATION OF AN ARCTIAN WITH
NOTES ON OTHER ALLIED GENERA.

BY HARRISON G. DYAR, BOSTON, MASS.

In examining the venation of *Pyr-rharctia isabella*, I found a considerable range of variation. Seventeen specimens were examined and they varied in the following manner. In thirteen of them, vein 10 of primaries arose from the stalk which bears veins 7-9, at a variable distance from its origin (see pl. 19, fig. 3 *a* and *g*). This is to be considered the normal venation. In one specimen vein 10 arose from the subcostal vein on the discal cell (fig. 3 *f*), and in two others it arose from a stalk with vein 11. In one of these latter, the stalk arose from the subcostal vein (fig. 3 *c*) and in the other from the stalk which bears veins 7-9 (fig. 3 *b*). The latter specimen was further abnormal in lacking veins 4 and 5 of the primary of one side. Another variation is shown in fig. 3 *a* and *b*, in which either veins 7 and 8 or 8 and 9 are on a common stalk, that is to say in one case vein 9 is given off before 7, and in the other, 7 before 9. A slight variation in the secondaries is shown in fig. 3 *d* and *e*, where veins 3 and 4 are either fused or well separated at origin.

There is here a sufficient range of variation among the subcostal venules to found four genera upon. Moreover, it is probable that other genera may vary as much, so that it would be well

to consider this possibility in using such tables of genera as that by Prof. Smith in Can. ent., xxii, 233, where the origin of vein 10 is used as an important character. While speaking of this table, I will mention that the genera *Eupseudosoma*, *Nelphe* and *Ectypia* are wrongly placed. The former lacks veins 5 and 8 of secondaries; the second also lacks vein 8 of secondaries and has veins 7-10 of primaries on a stalk; the third genus has an accessory cell, and should have been placed with *Nemeophila*. Prof. Smith states that two of these genera are placed by him partly by guess, as indeed seems evident.

Genus *Spilosoma* Steph. This genus differs from the new genera *Neoarctia* and *Elpis* recently established by Mr. Neumoegen and myself, in the position of the ocelli. In *Spilosoma* they are situated close on the margin of the eyes; in the new genera they are separated from the margin by a considerable space.

S. vestalis Pack. In specimens from Oregon the apex of the fore wings is more pointed and the outer margin more oblique than in those from California. The black spots, too, seem less strongly marked, and I took several specimens at Portland in which the abdomen was quite immaculate.

For this form, the varietal name *amelaina* would seem not inappropriate. They closely resemble *S. latipennis* in general coloration.

Genus *Elpis* Dyar. I have to correct a statement in my description of this genus (Ent. news, iv, 36). The median spurs of the hind tibiae are not absent as the wording implies, but are situated close to the posterior pair (pl. 19, fig 4 c). The genus differs from *Neoarctia* in the shape of the front of the head, which is narrowed above and below, while in *Neoarctia* it is broad and square. Fig. 4 b shows vein 7 of secondaries furcate, as it was in one specimen. I am now of the opinion that *Antarctia vagans* Boisd. would be better placed in *Elpis* than in *Spilosoma*, since it has the ocelli distant from the eyes and the front narrowed above and below, though the vestiture and coloration are more like *Spilosoma*. I am greatly indebted to Mr. Thomas E. Bean of Laggan, Alberta for several specimens

of *Neoarctia beanii*, from which the drawings on the plate were made (fig. 5 a-e).

EXPLANATION OF PLATE 19.

Fig. 1a. *Spilosoma virginica*; venation of primary.

1b. Same; venation of secondary.

1c. Same; hind tibia, showing spurs.

2. *Phragmatobia rubricosa*; venation.

3a. *Pyrrharctia isabella*; venation of primary.

3b. Same; abnormal venation.

3c. Same; abnormal venation (partial).

3d. Same; venation of secondary.

3e. Same; venation of secondary (partial)

3f. Same; origin of subcostal venules (abnormal).

3g. Same; origin of subcostal venules (normal).

3h. Same; three joints of ♂ antenna.

4a *Elpis rubra*; venation of primary.

4b. Same; venation of secondary, showing variation.

4c. Same; hind tibia, showing spurs.

5a. *Neoarctia beanii*; venation of primary.

5b. Same; venation of secondary.

5c. Same; hind tibia, showing spurs.

5d. Same; base of ♂ antenna.

5e. Same; three joints of ♀ antenna.

LOCAL NOTES.—The Peabody academy of science of Salem has recently transferred to the entomological department of the Museum of comparative zoology of Cambridge a number of types of insects of various orders described by Dr. Packard; the types were in the exhibition cases at Salem and were overlooked when the greater part of the entomological collections of the Academy were deposited in Cambridge.

In *Psyche* v. 6. p. 316 it is noted that the volume on the animals and plants of Maine prepared by the late Dr. John W. Randall was unpublished. Recently we learned that

the manuscript was placed in the hands of the Maine geological survey for publication and was subsequently lost. Dr. Randall's collection of insects was entirely destroyed many years ago. It may not be uninteresting to state that the Boston society of natural history received from Dr. Randall's estate the sum of \$5000,—the income of which, in accordance with the wishes of Miss Randall, will be devoted to the library.

The gypsy moth has been found in Franklin Park, West Roxbury, outside the limits of the hitherto infected district as mapped two years ago.

(Continued from page 490.)

stalked, the stalk given off at the end of the cell; veins 9 and 10 are given off from the end of a secondary cell located near the base above the lower cell. Type *H. castanea*, Holl.

158. *H. castanea*, sp. nov. ♀. Palpi, front and collar pale rufous; patagia hoary, whitish; upper side of thorax pale ochraceous; abdomen and legs rufous. The primaries on the upper side are very pale reddish-brown with the outer margin and the inner margin near the base whitish. The wings are marked by a broad chestnut red ray, which runs from the costa at the base outwardly to the outer margin, where it is widened covering the outer angle and the inner margin for one-third of its length from the outer angle. At the end of the cell, there is a dark brown annulus pupilled with lighter brown. There is a geminate waved sub-basal and transverse limbal line. From the apex a broad line runs inwardly terminating upon vein 6. There is a submarginal series of lunulate yellowish marks defined internally by pale brown lines and outwardly on the margin by very heavy dark brown lines. The secondaries on the upper surface are pale creamy with a dark brown patch near the anal angle, and the fringes for one-half of the distance from the anal angle are likewise dark brown. The wings on the under side are very pale yellowish-rufous, the markings of the upper side reappearing very faintly and indistinctly. Expanse, 68 mm.

The only specimen of this beautiful species which I have ever seen was bred from a small, oval, dark brown cocoon, which was found adhering to a leaf, and from which the imago emerged April 27th, 1891. The insect is apparently quite rare.

METANASTRIA, Hübner.

159. *M. porphyria*, sp. nov. ♂. Palpi, front and collar dark brown; patagia brown

shading into purplish, hoary in certain lights; the upper side of the abdomen is purplish-brown; the under side of the thorax and abdomen is paler. The primaries are brown with a purplish white canescence. They are crossed by a number of dark brown lines, one running from the costa at the base to the middle of the inner margin, the next crossing the middle of the cell to the outer angle, forked at the costa and connected with the basal line about the middle and near the inner margin by transverse branches. The third line of the series is broad and does not quite reach the outer margin at its outer extremity bifurcating along the median nervules. The fourth line runs diagonally from the costa toward the outer margin and is slightly curved inwardly. There is a submarginal series of angulated whitish markings, most conspicuous near the apex, which is heavily clouded with dark brown. The secondaries are pale brown with the fringes whitish. On the under side the wings are dark brown crossed by obscure median bands of darker brown. The costal area of the secondaries is irrorated with purplish-white. The light submarginal markings of the upper side reappear faintly upon the lower side. Expanse, 63 mm.

160. *M. (?) spargata*, sp. nov. ♂. Palpi pale chestnut margined externally with dark brown; front pale rufous; collar brown, margined internally and externally with dark brown patagia reddish; upper side of thorax and abdomen pale rufous; legs ferruginous, the tarsi black; the under side of the thorax and abdomen is rufous. The upper side of the primaries is dark brown with the basal area and a broad band running from the apex to the inner margin pale ferruginous. These areas are defined outwardly and inwardly by scalloped dark lines defined within by pale yellowish-red shading into whitish toward the costa. At the end of the cell, there is a moderately large circular white spot margined with dark brown. The fringes

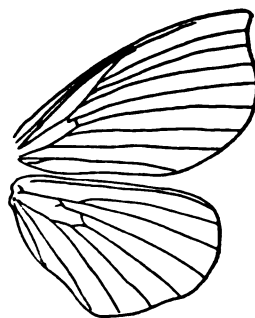
are very dark brown margined internally by paler brown. The broad band of paler color which crosses the outer area of the primaries is continued upon the secondaries which have the same general ground color as the primaries. On the under side the wings are light yellowish, clouded heavily with dark brown on the base, the apex of the primaries, and upon the costa of the secondaries. The dark spots and lines which define the outer and inner limits of the transverse limbal band of the wings on the upper side reappear upon the lower side, being most distinct upon the secondaries. Expanse, 65 mm.

This species is referred with great doubt to *Metanastris* from which the form of the antennae and palpi together with the greater breadth of the wings differentiate it. Unfortunately, the very heavy vestiture of the wings and the fact that I have but one specimen prevent me at present from making a critical anatomical diagnosis.

EPIJANA, gen. nov.

Superficially resembling the genus *Jana*, from which it, however, is structurally quite different. Palpi minute, directed forward, heavily clothed with hair, the last joint obsolete. Antennae of the male heavily pectinated, the pectinations moderately long, decreasing abruptly in length at the apex. The antennae of the female are almost devoid of pectinations, except at the base where the setae are very minute. The fore-wings are produced at the apex. The outer margin is somewhat excavated below the apex, and then rounded regularly to the outer angle, which is likewise evenly rounded. The inner margin is rounded. The secondaries have the costa relatively long, almost straight; the apex and the outer margin evenly rounded; the anal angle produced inwardly, or slightly lobed; the inner margin slightly excavated above the anal angle and bowed toward the abdomen before the base. In the primaries the upper

disco-cellular is angulated; veins seven, eight, and nine are stalked: vein eleven springs from the subcostal near the base and coalesces with ten beyond nine, forming an elongated secondary cell above the true cell. The costal nervure runs parallel to vein eleven and terminates upon the margin about the middle of the costa. In the secondaries, the costal nervure is conformed to the costal margin along the edge of which it lies; veins six and seven are stalked. The vestiture of the wings is heavy as in *Jana*. Type *E. lanosa*, Holl.



Neuration of *Epijana lanosa*, Holl., ♀ 3.

161. *E. lanosa*, sp. nov. ♂ Palpi, front and thorax rich brown; abdomen fawn; lowerside of thorax and abdomen together with the legs bright ochraceous, the anterior margins of the legs being brown. The culmen of the antennae is whitish, the pectinations testaceous. The primaries are crossed by a straight blackish, or very dark brown, line which runs from the costa before the apex to the inner margin about its middle, and is defined outwardly by a narrow line of pale lilac. The wings within this line toward the base are dark brown, beyond it they are paler brown, dusted near the apex and above the outer angle with lilac scales. The fringes on the outer and inner margins are very heavy brown, tinged with lilac. The secondaries are bright yellowish-ochraceous, laved with brown shading into lilac upon the inner margin and

at the anal angle. In some specimens, an incomplete transverse brown band extends half way across the wing from the inner margin. On the underside, both wings are bright ochraceous with the costae and fringes lilacine-brown.

♀. The female does not differ from the male in its markings, save that on the underside the costa of the secondaries is not shaded with brown and the fringes on the under side are lighter than in the male. Expanse, ♂, 75 mm. ♀, 80 mm. Habitat Kangwé and Benita.

There is a specimen of this beautiful species in the collection of Mr. Herbert Druce.

162. *E. cinerea*, sp. nov. ♀. Front brown; body and legs fawn. Primaries grayish-fawn crossed beyond the cell by a straight, dark brown transverse line, which runs from the middle of the inner margin to beyond the middle of the costa just before reaching which it is bent inwardly toward the base. This line is followed by an obscure parallel line of the same color which extends from the inner margin to a point opposite the end of the cell. This is in turn succeeded by an irregularly curved series of brown sagittate markings followed on the outer margin below the apex and near the outer angle by broad, dark brown cloudings. The fringes are lilacine-brown. The secondaries are in color like the primaries crossed by regularly curved transverse median, transverse limbal, and transverse submarginal lines, which are somewhat obscure in the region of the costa. On the underside, the wings are fawn heavily sprinkled with minute brown scales, giving them a "pepper and salt" appearance. The lines and markings of the upper surface reappear faintly on the underside. In certain lights, the underside of the wings displays a beautiful pavonine iridescence, as in *Stibolepis subiridescens*, Holl. Expanse, 75 mm.

163. *E. tenuis*, sp. nov. ♀. Body and legs ochraceous, paler beneath. There is a line of black spots running from the collar to the extremity of the abdomen along the dorsal line. Primaries plumbeous, crossed by a dark brown, straight line, which runs from the costa to the inner margin about three-fourths of their length from the base. The secondaries are orange-red with the outer third broadly and uniformly margined with dark plumbeous-brown. On the underside, both wings are uniformly bright orange-red, with their outer margins bordered as the outer margins of the secondaries upon the upperside. Expanse, 45 mm.

This beautiful species agrees structurally in all respects with the two larger species described above, so far as the female specimen which is before me shows. The type is unique.

JANA, H. S.

164. *J. nobilis*, sp. nov. ♂. Antennae pale testaceous; palpi brown; front pale gray; collar and patagia dark fawn; pectus and first pair of legs dark fawn of the same color as the collar; the thorax, abdomen, and the two last pairs of legs pale fulvous. Upperside: The primaries are fawn of the same color as the collar with the inner margin and the outer angle pale cinereous. The wings are crossed before the base by a straight transverse line of dark brown margined inwardly with pale cinereous. This is succeeded by a similar line which crosses the middle of the cell and is parallel to the first. There is a short linear brown line at the end of the cell defined inwardly by gray. Beyond the cell there is a straight transverse dark brown line running from beyond the middle of the costa to the middle of the inner margin, where it nearly touches the line crossing the middle of the cell. This is defined inwardly by a broad, pale gray shade. This line is followed by another straight transverse line running from the costa three-

fourths of the distance from the base to the inner margin two-thirds of the distance from the base, defined inwardly by a pale gray line, which is interrupted on the nervules by ochraceous dots, marking the origin of a regular series of hastate markings which lie on the side toward the base with their points toward the base, which are dark brown shaded with pale gray toward the margin. Beyond this dark brown line the outer third of the wing is fawn marked by a subapical brown shading and a similarly submarginal shading near the outer angle, both fading inwardly into gray. The secondaries have the costa and the outer margin of the prevalent fawn color of the primaries with the inner margin and inner angle broadly glaucous gray. There is a broad patch of black hairs at the base followed by a black incomplete transverse band running from the inner margin to beyond the end of the cell, and gradually widening from the inner margin. This is followed by a narrower black line which is very obscure upon the costa, but gradually widens toward the inner margin and becomes more distinct and terminates upon the internal vein. This is again followed by a very broad, dark brown band which runs from the costa before the outer angle to the inner margin, its inner edge being straight, its outer edge curved and denticulate, and defined by a pale gray waved line. The under side of the wings is very pale fawn, the bands beyond the end of the cells reappearing from the upper surface, paler, but more distinctly defined. Expanse, 130 mm.

165. *F. marmorata*, sp. nov. ♂. Palpi blackish-brown; antennae and front pale grayish; collar dark brown; patagia, thorax, and upper side of abdomen dark fawn; legs and lower side of abdomen brownish. The prevalent color of the upper and lower side of the wings is dark fawn, paler toward the apex of both wings. The primaries have a small circular white dot at the end of the cell on both

sides of the wing. Upon the upper side of the primaries near the inner margin before the base there is a small subquadrate blackish spot, and on the costa of the primaries before the apex a similarly colored short band constricted at the middle. In addition, the basal third of the primaries is crossed by a series of waved and denticulate lines forming intricate patterns. About the middle of the primaries beyond the cell there are four waved and denticulate lines arranged in pairs, the inner pair curving toward the base on the costa, and toward the inner margin about its middle, the outward pair bowed outwardly beyond the region of the cell. These lines are followed by a straight dark brown line running from the apex to the inner margin three-fourths of the distance from the base, defined inwardly by a paler line interrupted on the nervules by small subhastate markings. The nervules beyond this straight line for a short distance are dark brown and accentuated with small whitish dots. Beyond these again are paler cloudings followed by darker cloudings, that nearest the outer margin below the apex being the darkest. The secondaries have the transverse lines of the primaries continued upon them, most distinctly marked toward the inner margin. Near the apex of the secondaries is a broad brownish patch constricted somewhat at the middle. On the under side of both wings the lines of the upper side reappear upon the pale fawn ground beyond the cell, but are more regular and more distinct.

♀. The female is marked much as the male but all the markings are paler and more obscure. Expanse, ♂, 78 to 82 mm., ♀, 85 to 87 mm. Habitat, Kangwé and Talaguga.

In one of the males before me, the transverse markings of the upper side of the primaries are almost obsolete.

TARAGAMA, Moore.

166. *T. choerocampoides*, sp. nov. ♂. Palpi and front yellowish; patagia and lower edges of collar rich rosy-brown; the middle of

the collar dark brown, punctuated on the median line by grayish scales; the inner edges of the patagia blackish; the middle of the thorax hoary marked by three narrow parallel dark brown lines; upper side of thorax rosy-brown; the palpi and pectus and under side of the thorax and abdomen dark sooty-brown with a narrow black line upon the ventral line of the abdomen. Legs are concolorous, with the tarsi grayish. The primaries on the upper side are rosy-brown, shading into yellowish at the base and are traversed by four nearly parallel curved brown lines, which run from before the apex to the middle of the inner margin. The outer margin is evenly bordered with a dark brown shade. The subcostal nervules appear distinctly upon the darker ground of the wing, being pale yellowish. The pattern of marking strongly recalls that of many species of *Choerocampa*. The secondaries are uniformly rosy-brown, shading into yellowish at the costa near the base. On the under side, both wings are dark rosy-brown, shading into yellowish upon the inner margin of the primaries. The bands of the upper surface faintly reappear upon the lower side. Expanse, 60 mm.

167. *T. livida*, sp. nov. ♂. Body slaty-gray, or mouse color, shading into blackish at the anal extremity of the abdomen. The patagia are black, margined with mouse color. The costa and the inner margin of the primaries on the upper side are broadly pale mouse color. From the base at its middle there arises a black shade, which widens outwardly and extends from the apex to the outer angle, being darkest at the base. It is traversed by a dark black line running from the end of the cell to its lower margin and by a similar line running from the apex to its inner margin and is interrupted beyond this last line by five or six small submarginal whitish spots, those nearest the apex being the most distinct. The secondaries on the upper side are dark mouse color with the costa and the

inner margin paler and the outer margin a trifle darker. The fringes on both wings are very narrowly pale mouse color. On the under side both wings are pale mouse color with the inner margin of the primaries lighter and the outer margins of both wings slightly darker. The fringes are as on the upper side with small blackish marks at the tips of the nervules. Expanse 38 mm. Habitat Talaguga.

This may be the male of *T. (Pachypasa) Gräberii*, Dew.

168. *T. fuliginosa*, sp. nov. ♂. Allied to the preceding species in form and size, but differing in that the prevalent color is sooty-black on both sides of the wings. The broad diverging median ray which appears in the preceding species is also characteristic of this species, being defined as a more intense black upon the blackish body of the wing. The transverse lines of the primaries which appear in the preceding species are lacking in this form as also the submarginal series of light spots. Expanse 40 mm.

This may be a highly melanic form of the preceding species, but the fact that numerous specimens of it have been taken which are all quite constant in their markings suggests that we have to do with a distinct form.

169. *T. Honrathi*, Dew. ♂. The female of this species was described by Dewitz. In a suite of eighteen specimens bred from larvae, there are ten males. Front and upper side of thorax hoary-gray; metathorax heavily clothed with rosy-brown hairs; upper side of thorax grayish-brown; under side of thorax brown; under side of abdomen ochraceous. The primaries are hoary-brown on the upper side crossed upon the middle by a broad band of dark brown, margined externally and internally by waved and denticulated lines of darker brown and interrupted throughout its entire length from the costa to the inner margin by two parallel curved series of blackish subhastate markings the innermost series pointing outwardly, the outermost

pointing inwardly, and in many instances connected between their apices by narrow black lines following the nervules. Beyond this dark band is a band of paler color, denticulated inwardly, and irregularly angulated and denticulated outwardly. The secondaries are reddish-brown shading into ochraceous upon the costa and at the base. On the under side, the primaries are hoary upon the costa and the outer margin; the median area broadly and uniformly maroon defined outwardly by two parallel dark curved lines running from the costa to the inner margin before the outer angle. The inner margin near the base is smooth, shining pale yellowish. The secondaries are of the same color as the primaries laved with maroon upon the median area and toward the base. The transverse outer lines of the primaries are continued upon the secondaries. Expanse: ♂, 50 to 70 mm; ♀, 75 to 130 mm.

Mr. Kirby has referred the preceding species to Moore's genus, *Taragama*, which he places among the Pinaridae. I accept the reference of this and the other species herein described to this genus provisionally. *Taragama* is, however, as Mr. Hampson has shown, a *Lasiocampid* genus.

Mr. Good has been quite successful in rearing this species from the larva, and I shall have occasion later to more fully describe its life history. The last batch of specimens of this species sent to me was reared from larvae which were evidently underfed and are dwarfed in consequence. A brood was taken in the branches of a tree called Ntyei overhanging the bank of the river. Mr. Good says, "When first found, the least disturbance would cause them all to fall off the branches. I wondered how this would work, where they overhung the water until a few days ago, when I saw a caterpillar much like these fall into the water. It did not seem to be in the least disconcerted, but drawing its abdominal end forward under itself, and then forcibly straightening itself, swam quite easily. I have no doubt that this and many related

species, the larvae of which are generally found hanging over the water, can swim."

GASTROPLAKAEIS, Möschl.

170. *G. forficulatus*, Möschl. ♀. Front, collar, patagia and thorax pinkish-brown. The patagia are fringed inwardly with long erect hoary hairs. The pectus and thorax below are hoary-gray. The abdomen is rufous. The primaries are rosy-brown, shading on the outer margin into hoary-gray. They are crossed by obscure, transverse basal, sub-basal, and geminate limb and sublimbal dark brown lines. They have a very distinct patch of dark black raised scales at the end of the cell, margined narrowly by pale gray. The secondaries are fuscous, shading into rufous at the base. On the under side, both wings are brown with the costae and the outer margins profusely sprinkled with hoary scales. Expanse 95 mm.

Möschler erected his genus *Gastroplakaeis* for the reception of an insect of which he knew only the male. The female which I describe corresponds sufficiently, in the light of what I know in reference to the succeeding species, with the male of *G. forficulatus* to justify me in reckoning it as that sex of Möschler's species. Möschler laid stress upon the formation of the brush of hairs at the extremity of the abdomen. This was no doubt due in the specimen before him to the expanded posture of the male claspers, and is not either of generic or specific value, as is shown by numerous specimens in my possession. The genus, however, is very well marked, and the female especially differs in curious particulars, noticeably in the high and conspicuously tufted inner margins of the patagia, from other African *Lasiocampid* genera. The genus is quite as remarkable as *Pachypasa* and *Gonometra* on account of the wide dissimilarity in size and marking between the two sexes.

171. *G. Greyi*, sp. nov. ♂. Palpi, front, collar, and thorax hoary-gray; abdomen on the upper side orange-pink annulated by seven lines of jet black, tipped with a long tuft of cream colored hair. The under side of the thorax at the base of the wings and the metathorax are orange-pink. The pectus and lower side of the thorax and abdomen are pale hoary gray. The legs have the tibiae heavily clothed with dark hoary scales. The tarsi are blackish. The primaries on the upper side are hoary-gray like the thorax, paler on the outer margins. The inner margin is provided at the middle with a series of long blackish hairlike scales, which project outwardly and give the inner margin a lobed appearance. The wing is ornamented by a spot of deep black velvety raised scales at the end of the cell, and is crossed by an obscure denticulate sub-basal line followed by a geminate more distinct waved and denticulate transverse median line, followed beyond the cell by a similar less distinct line which curves outwardly and runs from the costa to the inner margin at its lobe-like hairy projection there apparently uniting with the transverse median line. The outer margin, which is broadly pale hoary gray, is slightly clouded with darker brown on the apex near the costa and on the outer angle and is marked by a few obscure submarginal brown spots. The secondaries are dark brown broadly laved with orange-pink at the base and on the inner margin. They are crossed by an incomplete black median band which runs from beyond the end of the cell to the inner margin, where it coalesces with a short blackish longitudinal ray situated near the inner angle. This transverse line is followed by a very obscure submarginal dark shade. The neurations, which are pale, stand out in strong relief upon the darker ground of the wings. On the under-side, the wings are hoary-gray with the neurations pale yellow and standing out distinctly upon the darker background. The contrast is made more effective on the median

area of both wings by the clouding of the intraneural spaces with dark brown, or blackish. The secondaries have the inner margin broadly laved with orange-pink.

♀. The prevalent color of this sex is dark chocolate-brown, darkest upon the outer margins of the primaries and secondaries. The primaries are crossed by the same lines which appear in the male, but modified by reason of the different form and greater expanse of the wing. The black patch of raised velvety scales at the end of the cell is distinct in this sex and the tufted formation of the patagia which are margined with black externally and sprinkled with ochraceous hairs is very characteristic. On the under side the costa, which is produced just before the base and has its costal margin quite straight beyond this projection, is clothed upon its edge with long projecting hairs. There is no trace whatever in this sex of the broad orange-pink markings of the male. Expanse, ♂, 80 mm.; ♀, 135 mm.

I have two females of this species which were bred by Mr. Good from larvae. He exposed a virgin female in a cage and succeeded in assembling the males which are referable to Möschler's genus *Gastropylakaeis*, which, without a knowledge of this fact, would at first glance appear to be an improbable assortment of the sexes. I take pleasure in naming this beautiful species after my good friend, Robert M. Grey, who is one of our most ardent collectors, and who for nearly a year rendered me faithful service in expanding and arranging my great African and Indian collections.

LEIPOXAIS, gen. nov.

Allied to genus *Libethra*, strictly congeneric with *Gastropacha haematidea*, Snell., which is referred by Kirby to *Libethra*, where, however, it does not belong, as is clearly shown by the neuriation. The palpi are large, compressed, directed forward, and heavily clothed with hair. The antennae of

the male are relatively short, heavily pectinated, directed forward and then recurved about the middle. The antennae of the female are very minutely pectinated, appearing simple to the naked eye. The primaries of the male are broad, subtriangular, with the costa strongly arched, the outer margin and the outer angle evenly rounded, the inner margin almost straight. The secondaries of the male have the costa strongly produced upwardly about the middle, giving the costa a lobed appearance. The apex, the outer margin, and the anal angle are evenly rounded. In the female the primaries are sharply produced at the apex and subfalcate. The secondaries have the costa as in the male sex. The female is twice as large as the male. In both sexes the discocellulars of the primaries are angulated; veins six and seven and nine and ten are stalked. Vein eleven apparently coalesces with twelve about its middle. Twelve is continuous along the costal margin. In the secondaries veins four and five are stalked; veins six, seven, and eight diverge widely, vein eight terminating at the extremity of the lobed projection of the costal margin. Type *L. peraffinis*, Holland.



Neuration of *Leipoxais peraffinis*, Holl., ♂, 1.

172. *L. peraffinis*, sp. nov. ♂. Body and appendages reddish-brown. Primaries and secondaries of the same color as the body, the secondaries inclining to luteous on the inner margin and the primaries shading on the outer margin in many specimens into cinereous. The primaries are ornamented by a curved sub-basal obscurely blackish line followed by a minute silvery white dot on the cell, after which there are two irregularly curved obscurely blackish transverse lines,

which diverge on the costa and converge at the middle of the inner margin. Beyond this there is a sinuous band of small obscure blackish sub-hastate spots extending from before the apex to the outer third of the inner margin. The secondaries on the upper side have no markings. The primaries on the under side are pale fuscous without markings except that the transverse bands of the upper side very faintly reappear on the lower side in some specimens. The secondaries on the under side are marked by a very sinuous band of angulated spots extending from before the apex irregularly parallel to the outer margin as far as the first median nervule. The lobe-like projection of the costa is clouded with dark fuliginous and a similar fuliginous spot is located beyond the cell upon the median nervules not very far from their origin. The inner margin is pale stramineous.

♀. In the female the upper side is marked very much as in the male, save that the sinuous submarginal band of the primaries is composed not of blackish, but of pale whitish spots, and on the under side there is a dark brown spot on the costa before the apex accentuated outwardly by two whitish dots, and the secondaries are crossed by a very broad transverse median and a somewhat narrow transverse submarginal band of dark reddish-brown. Both of these bands terminate inwardly upon the first median nervule. Expanse, ♂, 32 mm.; ♀, 56 mm.

There is what appears to be a variety of this species in which the space between the two outermost transverse bands of the primaries is paler than the body of the wing, inclined to luteous, and in which the whole median area of the secondaries on the upper side is likewise pale. There is a very marked resemblance in this species to the insect described as *Gastropacha kaematidea*, Snell., but the fringes in this species, of which a suit of fifteen specimens is before me, are not checkered as in the insect described by Snellen, but are uniformly brown and the markings are different in other respects.

NOTES ON GLUPHISIA AND OTHER NOTODONTIDAE.—II.

BY A. S. PACKARD, PROVIDENCE, R. I.

The structural differences between *G. trilineata* and *G. wrightii*, var. *slossoniae*, and which at first led me to think them generically distinct, are the following:

A ♀. The head is remarkably small, much more so than in *G. trilineata*; and is loosely scaled in front. The antennae are pectinated, the branches a little longer than in ♀ *trilineata*. The palpi are short, small, depressed, with loose scales; and they are not quite so large and long as in *trilineata*. The thorax differs from that of *Gluphisia trilineata* in having a median dorsal tuft. The legs are hairy, and much as in *trilineata*, the tarsi being ringed with gray and darker scales. The fore wings are narrow but with the costa unusually convex, much more so than in *trilineata*; the apex is somewhat rounded, but much as in *trilineata*; the outer edge is very faintly excavated below the apex. The hind wings are of the same shape as in *trilineata*. There are six branches of the subcostal vein: branch 1 is longer than in *trilineata* and ends half way between end of costal vein and end of branch 2 of the subcostal; the costal area is wider towards apex than in *trilineata*. The 5th and 6th branches are nearly as in *trilineata*. The lower discal vein is not so much bent as in the last named species. The three median veins are nearly as in *trilineata*, but the 2d median space is wider than in that genus. The submedian vein is represented by a simple fold. In the hind wings the two branches of the subcostal are much longer than in *trilineata*, the space between them being long and narrow, in *trilineata* short and broad triangular. The discal veins are, taken together, slightly curved, where in *trilineata* they make a decided angle at the origin of the independent vein; and there is a common origin of the lower discal, and of the two median

veinlets. The second median interspace is much wider than in the species of the other section of the genus. The submedian vein is represented by a simple fold.

G WRIGHTII VAR. SLOSSONIAE.—Body and wings pale ash-gray; the prothoracic segment colored as the head, but the rest of the thorax is dark brown, the median thoracic tuft also dark brown. Fore wings black-brown on basal one-fifth; this portion sending out five sharp tooth-like projections along the subcostal, submedian and internal veins. A broad distinct median oblique band, with irregular lobulate edges, and widening on the costa; it encloses a very distinct discal triangular white spot, the apex pointing outwards. A submarginal broken row of dark spots arranged much as in *Gluphisia trilineata*.

Hind wings with no markings, but at the inner angle is a faint short curved dark band, edged externally with white, but not reaching beyond the middle of the submedian space. Fringe concolorous with the wing, but checkered with small black spots.

Wings beneath much as in *Gluphisia trilineata*; the black band is faint. its outer edge indicated on the costa by a dark spot. Expanse of wings, 38 mm; length of body, 15 mm.

NADATA BEHRENSII H. Edw. Types, 2 ♂ 1 ♀. Siskiyou Co. and Butte Co. Cal. This does not seem to differ from *N. gibbosa*. The ♀ has a paler body and wings, the fore wings are more pointed, and as in many Pacific coast moths, it is larger than the eastern form of *gibbosa*. On examining my type of *N. doubledayi* in the collection of the American entomological society I find that it is not even a variety of *gibbosa*. It only differs in having the under side

of the palpi and of the fore legs dusky.

OEDEMASIA PERANGULATA H. Edw. 1 ♂. Type, Colorado. A very distinct and good species.

OEDEMASIA SALICIS 1 ♂. Type, California. I also have a ♂ given me some years since by Mr. Edwards. I cannot after repeated examination really perceive any differences between this and the eastern *concinna*; it only differs in size, being a little larger, and with slightly more pointed fore wings, as one would expect to find it, in accordance with the facts pointed out in my Monograph of Geometrid Moths (p. 587) where a list of twenty-five species of Geometrids which grow larger on the Pacific than the Atlantic coast is given.

OEDEMASIA EXIMIA Grote. I have been unable to find any valid distinctions between this and *concinna* (also *salicis*), except that the insect is larger, and the fore wings more produced towards the apex. The females of the normal *concinna* differ notably from the males in having pale chocolate hind wings, while in the males they are white, with a dusky patch at the internal angle. The three above mentioned so-called "species" also agree in having a similar distinct round discal dot.

OE. BADIA Pack. is a distinct species, and differs from *Oe. concinna* in the long linear discal spot, outside of which is a dark reddish brown shade. There are also distinct scalloped reddish brown lines at the base, and beyond the discal spot. The thorax is also darker red.

OE. PERANGULATA H. Edw. Type from Colorado. This is a distinct, well marked species.

On re-examining the venation and other imaginal characters I am at present unable to perceive any important generic differences between *Oedemasia* and *Schizura*, and probably the species of the former will have to be merged with those of *Schizura*.

SCHIZURA EDMANDSII (Pack.). This is evidently a synonym of *S. unicornis*. The specimen (♂) marked *edmandsii* in Mr. Edward's collection appears to be only a small *unicornis* with narrower wings than usual. The only difference is in the dusky tawny costa of the fore wings, and the similarly tinted hind wings, due perhaps to imperfect preservation.

S. CONSPECTA (H. Edw.). 1 ♂. Type, California. This is only a climatic variety of *S. unicornis*; the position of the markings is identical in the two forms, but *conspecta* is larger, the fore wings as much produced as in any of *unicornis*. The pale area on the outer third of the wing is clear and whitish, and the hind wings are clearer and whiter than in any eastern example of *unicornis*.

S. TELIFER (Grote). This is only a variety of *S. ipomeae*, with two long distinct black streaks, one passing through the discal spot, and the other extending along the submedian vein.

JANASSA COLORADENSIS H. Edw. Type. 3 ♀, Utah. A climatic variety of *J. lignicolor*. It is whiter, paler, freer from dark scales, probably due to living in a drier climate, flying over a paler soil, under a clearer sky. Yet an individual of *J. lignicolor* from Georgia, in the same collection, comes very near it.

ON A FLESHY LEAF-GALL ON
SCRUB OAK.BY C. H. TYLER TOWNSEND,
KINGSTON, JAMAICA.

On the leaves of *Quercus undulata* var. *wrightii*, growing near Riley's water, at the western base of the Organ Mountains, there were found some large thick fleshy woolly-looking galls, May 14, 1892. The following description is made from them.

Gall.—Measurements of five galls are as follows: Greatest width (measured transversely on leaf), 18, 13, 15, 14, 17 mm.; greatest length (meas. longitudinally on leaf), 17, 17, 14, 22, 21 mm. respectively; greatest thickness, 8, 9, 11, 7, 8 mm. respectively. Gall consisting of a very marked thickening of the leaf, the thickened portion bulging out most conspicuously on the lower side of the leaf, beginning apparently usually about the middle of the leaf and gradually embracing nearly the whole of it, or all but a more or less complete margin; but sometimes situated at one end or in the middle of a leaf. Mostly whitish in color, but with more or less of a reddish-brown tinge, covered with very short and fine woolly pubescence, the extent of the swelling indicated not only by the thickness but also by this pubescence, while the mid rib and side ribs of the leaf are plainly indicated in exaggerated relief on lower surface by the partial or entire absence of the pubescence; ribs not indicated at all on upper surface. Irregular or rounded in outline, more or less flattened on upper surface of leaf, strongly convex and conspicuous on lower surface, the edges of the swelling bounded on lower surface by a hypertrophy of the small net-like veins of the leaf. Sometimes, in a smaller leaf, the lateral edges are embraced in the gall, which in that case bears laterally several of the marginal spines of the leaf appearing as part of the gall, the lateral margin being more or less completely involved in the swelling.

Described from five alcoholic galls. Color noted when freshly picked. Opening the galls disclosed larvae and pupae of a minute hymenopter (probably a cynipid), enclosed in small smoothly lined ellipsoidal cells, the latter about $\frac{1}{2}$ mm. wide by $1\frac{1}{2}$ mm. long. The cells are mostly in the middle of the gall, and quite closely approximated, about equally distant from the upper and lower sides of the gall (corresponding to the upper and lower sides of the leaf), and with their long axes perpendicular to the surface of the leaf.

Dofia Ana county, New Mexico.

ARCTIA YARROWI IN CANADA. — Although this fine moth has been known for twenty years it appears to be still very rare in collections. The description was based upon a single male from Arizona in collections made by the Wheeler survey in 1871, '72 and '73. Mr. Stretch's description appeared in vol. 5 of the survey reports, chapter 9, pp. 800-802, and the moth is figured on plate 40. It is to be regretted that the altitude was not stated in the text. Among my few *Heterocera* references I find only one other mention of *yarrowi*, in "Proceedings Davenport acad. nat. sciences", vol. 1, p. 189, where occurs the statement that a pair (σ φ) were collected in 1873 "high up above timberline" on Washakie Needle, a mountain in north-western Wyoming.

Near Laggan, Alberta Province, Canada, during the past seven summers, I have found but five *yarrowi*, 3 σ s 2 φ s, all of them above timberline on mountains five to six miles east of the British Columbia eastern boundary, at altitudes ranging from 7500 to 8500 feet. My examples differ to some extent on upper surface from the figure on plate 40. On inner margin of primary the two nearly marginal light spots near base of wing are relatively larger than in the figure, and on costal margin the two light spots near base have not the formal squareness shown in the figure but are irregularly rhomboidal. On hind wing the black spot of anal angle is

narrowly joined to the nearest median spot; in the figure these two spots are entirely separate. The local examples are remarkable for bilateral symmetry, which the figure markedly lacks. The light markings of primary in two of the local males are moderately more developed than in the Arizona male as figured. The two females have these light markings still more produced; in other respects they differ little from the males.

Comparing the description of *Arctia remissa* of Hudson Bay, doubtfully named by Henry Edwards as a new species (*Entomologica americana*, January 1888, p. 184), I find my local examples true *yarrowi* as distinguished from *remissa*, and not close enough to the latter to give much aid in determining its validity as a species. The color of the light markings on anterior wing of *yarrowi* is described in the text as "clear lemon-yellow"; in description of *remissa* it is stated as buff; in my local examples of *yarrowi* the color is buff, modified by a slight tinge of olive.

That *yarrowi* is strictly alpine in this district is not certain, though strongly indicated by the facts so far learned. If, in addition, its occurrence in Arizona should prove to be at low elevation, such a combination would make a most singular case in geographical distribution. Probably, however, its occurrence in Arizona is entirely alpine.

Thomas E. Bean

ENTOMOLOGICAL NOTES.—The Division of Entomology of the United States department of agriculture, has issued a circular regarding the appearance this year of either race of the "seventeen year locust," asking for any confirmatory experience as to the appearance or non-appearance of the insects in any locality. Any evidence giving the extent of territory over which they appear or any well-attested dates of their appearance in previous years, will be thankfully received and appreciated. The following list is prepared from previous records.

Brood XVI.—Tredecim—(1880, 1893).

Alabama.—Lowndes County.

Georgia.—Cobb and Cherokee Counties.

Tennessee.—Lincoln County.

North Carolina.—Lincoln and Moore Counties.

This brood is but little known, and all require further confirmation this year.

Brood XI.—Septendecim—(1876, 1893).

North Carolina.—From Raleigh, Wake County, to the northern line of the State; also in the counties of Rowan, Davie, Cabarrus, and Iredell.

Virginia.—From Petersburg, Dinwiddie County, to the northern line of the State; Bedford and Rockbridge Counties; Valley of Virginia from the Potomac River to the Tennessee and North Carolina lines.

District of Columbia.—Woods north of Washington.

Maryland.—Southern half of St. Mary's County.

Kentucky.—Trimble County.

Indiana.—Knox, Sullivan, and Posey Counties.

Illinois.—Madison County.

Kansas.—Dickinson and Leavenworth Counties.

Colorado.—Cheyenne Canyon.

This is a well-established brood, most of the localities in the Eastern States as well as those in Indiana and Illinois having been verified in the past years; but the localities in Kentucky and Kansas require confirmation, and that in Colorado is extremely doubtful.

Professor Riley in his interesting address on parasitism in insects, printed in the Proceedings of the entomological society of Washington, has, apparently, overlooked the fact that the "genuine oestrid larva" recorded and figured by Packard as taken from under the skin of the back of the neck of the box turtle, *Cistudo carolina*, has been proved by Wheeler (*Psyche*, v. 5, p. 403) to be a species of *Sarcophaga*.

Mr. J. M. Aldrich, lately of Lawrence, Kansas and formerly entomologist to the experiment station at Brookings, S. Dakota, has been appointed entomologist to the experiment station at Moscow, Idaho.

Rübsaamen has published in the *Berliner entomologische zeitschrift* (v. 37) a systematic study of the Cecidomyiidae of the Berlin museum, accompanied by 14 plates illustrating the structure of the wings, abdominal appendages, antennae, head, pupae and "breast bone". They are divided into 2 sub-families and 23 genera, 4 of them new; 80 species are considered.

The first (double) number of the same journal for 1893 is given up to the first installment of a description by Karsch of the insects of Adeli, West Africa, consisting of the Apterygota, Odonata, Orthoptera saltatoria, and butterflies.

Aldrich publishes in the first part of vol. 2 of the Kansas university quarterly a revision of the N. American species of the dipteran genera *Dolichopus* and *Hygroceleuthus*, 81 of the former (21 new) and 5 of the latter (1 new). An excellent plate is added, especially devoted to antennae.

Moore's *Lepidoptera Indica* (part 15) is still occupied with the Satyrinae; the early stages of only one species are figured, but the wet-season and dry season broods of eight species are distinguished.

PROCEEDINGS OF SOCIETIES.

CAMBRIDGE ENTOMOLOGICAL CLUB.

14 April, 1893.—The 178th meeting was held at 156 Brattle St., Mr. S. Henshaw in the chair. Mr. H. A. Morgan of Baton Rouge, La., was elected to active membership.

Mr. S. H. Scudder showed the fossil fly from Florissant which he had described under

the name of *Mycetophaetus intermedius*. Owing to a suggestion of M. Ch. Brongniart of Paris he had re-examined the specimen and found that he had been mistaken in referring it to the Mycetophilidae, since the antennae are brief and not very long as he had supposed and the relative stoutness of the legs showed that notwithstanding its apparently spurred tibiae and small size it belonged to the neighboring family Bibionidae and to the genus *Penthetria*, an existing genus already well-known in tertiary deposits.

Mr. A. G. Mayer remarked on the lepidopterous fauna of the Bahamas which he had just visited. All the species found by him, with the exception of a *Utetheisa*, are strong fliers, as the weak fliers are blown off shore by the trade winds. *Anosia plexippus* was seen as well as species of Pieridae, Heliconidae and Hesperidae. The fauna and flora seem derived largely from the United States, though in part from South America.

Mr. Scudder called attention to a recent paper by Hampson on stridulation in Lepidoptera and said he had heard a clicking sound from *Polygonia faunus* on Mt. Washington, N. H. Mr. Mayer said he had observed the same in *P. interrogationis*.

Mr. A. P. Morse exhibited specimens of the pupae and imagines of a moth found feeding on woolens; also the opened egg cocoon of a spider which in nature bore a considerable resemblance to an oak apple.

Dr. H. S. Pratt stated that he had recently been engaged in studying the embryology of the sheep tick. The head is developed in the embryo but is concealed in the larva by two imaginal disks, which are formed by invagination on the dorsal side at some distance from the anterior end; they remain latent during the larval state and in the pupa are developed into the head. The larva bears considerable resemblance to that of the fly.

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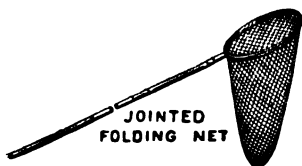
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PSYCHE.

NOTES ON GLUPHISIA.

BY HARRISON G. DYAR, NEW YORK CITY.

Dr. Packard has recorded his opinion concerning the species of *Gluphisia* in the August number of *Psyche*. From an examination of the same material, I have reached somewhat different conclusions, and it may not be without interest to compare the two views. The principal difference is in regard to *G. wrightii*. Dr. Packard considers it to be close to *G. severa* while I regard it as the ♀ of *G. albofascia*. I think that Dr. Packard has allowed himself to be led too closely by the statements of Henry Edwards, published with his original description. As in the case of *Ichthyura bifria*, where Dr. Packard has simply copied Edwards's statement as to the relationship of that species, so here he repeats this course. I have shown that *I. bifria* is not at all closely related to *I. brucei* as stated by Edwards, and, in the present case, *G. wrightii*, to my eye, bears no close relation to *G. severa*. I would certainly put it in the other section of the genus. The habitat is in accord with this arrangement, for the fauna of southern California is essentially that of the great arid region west of the Rockies (when the species are not endemic), while that of the Sierra Nevada is largely that of the Pacific

Northwest, and thus more similar to the Atlantic district.

Dr. Packard is inclined to consider *G. albofascia* and allies as "climatic varieties" of *G. ridenda*. As he does not define this term, I understand him to mean that they are modified to their present form by the direct influence of the climate of their habitat, and that if removed to some other region, they would not remain constant in their characters. That this is so cannot be assumed without proof, though the experiments of Weismann and others, to which Dr. Packard refers, might seem to indicate it.

I have not been able to perform any experiments in regard to these cases in *Gluphisia*; but I have done so in *Ichthyura*. There is a pale form of *I. vau* in the Rocky Mountain region, which bears much the same relation to *I. vau* that *G. ridenda* does to *G. trilineata*. Mr. C. A. Wiley had the kindness to send me eggs of this form from Miles City, Montana, and they were raised in the typically eastern climate of Boston; but produced an imago of the pale form.* I am inclined,

*The larvae had but four stages while *I. vau* from Boston have five, if my observations are correct. In the last case, I did not observe the stages in sequence, so that there is some chance of error. (See Can. ent., June and July 1892.)

therefore, to regard the climatic forms of *Gluphisia* as permanent, probably produced by the action of natural selection to fit them to their surroundings. I class them as local races, by which I mean that they are constant in their

characters, but differ only slightly and in unessential particulars from the first described species.

I give below Dr. Packard's arrangement of *Gluphisia* and my own in parallel columns.

Packard's Arrangement.

1. *G. trilineata* Pack.
var. *ridenda* Hy. Ed.
var. *rupta* Hy. Ed.
2. *G. albofascia* Hy. Ed.
var. *formosa* Hy. Ed.
3. *G. wrightii* Hy. Ed.
var. *severa* Hy. Ed.
var. *danbyi* Neum.
var. *avimacula* Huds.
var. *slossoniae* Pack.
4. *G. lintneri* Grt.

Dyar's Arrangement.

1. *G. trilineata* Pack.
race *ridenda* Hy. Ed.
race *quinquelinea* Dyar.
2. *G. albofascia* Hy. Ed.
var. *wrightii* Hy. Edw.
var. *rupta* Hy. Ed.
3. *G. formosa* Hy. Ed.
4. *G. severa* Hy. Ed.
var. *danbyi* Neum.
race *avimacula* Huds.
var. *slossonii* Pack.
5. *G. lintneri* Grt.

In tabular form, I separate the species as follows:—

Size small; no basal yellow dot (§ *Gluphisia*).

With a yellow (or black) central band on primaries.

Markings distinct *trilineata*.

Markings confused and irrorate *formosa*.

Pale, with no distinct yellowish markings *albofascia*.

Size large; a basal yellow dot on median vein (§ *Eumelia*).

A yellow angular discal dot *severa*.

No yellow discal dot *lintneri*.

NOTES.—On September 12th I caught, in Brookline, Mass., a large, battered *Papilio cressphontes*, which was flying rather feebly about some *Salvias*. It is the only one I have seen flying in Massachusetts.

At Nonquitt, Mass., Miss Ida M. Eliot and I had two larvae, *Arctians* unknown to us and certainly not *acrea*, of a cream-white color. The body was cream-white with three broken, blackish, longitudinal lines. There

were no dark hairs. These larvae we fed on wild indigo-plant, *Baptisia tinctoria*, and after a few days the larger larva moulted, coming out of a deep, glossy, indigo-blue color, almost black. The smaller larva first moulted of a deep-blue gray color, then again of a deep blue like the other. These larvae grew to a length of nearly 3 inches, and were very striking in appearance.

Caroline G. Soule.

(Continued from page 520.)

173. *L. major*, sp. nov. ♂. The wings have the same general appearance as in the preceding species. The basal area of the primaries is pale ferruginous defined outwardly by a curved brown line followed by a broad transverse median band of darker brown defined externally by a curved and sinuate dark brown line, which is produced upon the secondaries and is succeeded by a broad and somewhat diffuse brown line, which in turn is followed by a sinuate series of cinereous hastate spots, as in the preceding species. The outer margin of the primaries shades into lilacine. At the end of the cell, there is a large and conspicuous round silvery white spot. The secondaries have the costa broadly dark brown with the outer margin broadly paler brown. The base and inner margin are pale stramineous. On the underside, the primaries are reddish-fuscos crossed by a broad transverse median band and clouded with blackish at the apex and on the outer margin. The secondaries are reddish-brown heavily dusted with dark brown scales and clouded with dark brown at the base. A broad sinuate transverse median band of dark reddish-brown bordered externally and internally by blackish lines crosses the wing from the lobe on the costa to the first median nervule, and is succeeded toward the outer margin by a series of five or six blackish spots forming an irregular curved series and margined externally by pale gray.

♀. The female resembles the male in the general color of the wings, but lacks the silvery spot upon the cell and all the markings are not only much more obscure, but more intricate, the single transverse lines on the primaries in this sex being all geminate and darker, and the outer margin being heavily clouded with blackish. The secondaries are traversed by a broad and diffuse band of submarginal markings. The base and the inner margin are obscure brown, as the rest of the wing. On the under side, the

primaries are uniformly obscure brown with the outer margins and the apex heavily clouded with blackish. The transverse median band which appears in the male on the under side of the primaries is wanting. The under side of the secondaries is blotched and marbled with fuliginous upon a dark brown ground in a most intricate manner. Expanse, ♂ 48 mm. ♀ 68 mm.

Described from specimens taken in coitu.

174. *L. margine punctata*, sp. nov. ♂. Front, collar, and thorax pale fawn, inclined to ochraceous; upper side of abdomen, lower side of thorax and abdomen and legs very pale fawn. The wings are pale fawn, inclined to cinereous. The primaries are ornamented by a very pale ochraceous sub-basal curved line defined outwardly and inwardly by very narrow darker lines. This is followed by a lunulate silvery spot at the end of the cell, beyond which there is a straight transverse ochraceous limbal line, running from beyond the middle of the costa to the middle of the inner margin and marked externally and internally by very narrow brown lines. A conspicuous series of blackish dots produced outwardly between the first and second median nervules runs from the apex to the inner margin before the outer angle. The secondaries are cinereous and the submarginal series of blackish dots is continued upon them. The wings on the under side are pale cinereous, the markings of the upper surface reappearing faintly upon them. The fringes are separated from the body of the wing by a very fine black line and are obscurely checkered. Expanse, 35 mm.

GASTROPACHA, Ochs.

175. *G. cinerascens*, sp. nov. ♂. Allied in the form of the wings to *G. Gerstaeckerii*, Dew., but widely different. The body is pale cinereous, as also the upper side of both wings. There is a very irregular and obscure sub-basal line followed by a trifid silvery

spot at the end of the cell, succeeded by a band of transverse limbal markings, lunulate in form, whitish, and margined externally and internally by dark brown, succeeded by an interrupted submarginal series of obscure blackish spots. The secondaries, which are pale ashen like the primaries, have a large translucent circular spot at the end of the cell, and the lines of the primaries are continued upon the secondaries. On the under side the markings of the upper side reappear, but far more sharply defined and darker in color. Both wings, furthermore, are heavily clouded on the median area with dark slaty-gray.

♀. The female does not differ materially from the male, except in the much greater size and the corresponding modifications of outline and the much greater obscurity of the transverse markings. Expanse, ♂, 65 mm.; ♀, 95 mm.

The female in my possession was reared from a cocoon about three inches in length and three-fourths of an inch in diameter, which was found attached to the trunk of a tree. The cocoon is whitish in color, the exterior compacted of silk mingled with the whitish hair and the short but sharp blackish spines of the larva. The inner layers of the cocoon are hard and coriaceous. The chrysalis is relatively long, black, smooth, and without a cremaster. The insect may be distinguished from *G. Gerstäckerii* by its uniformly cinereous color and the absence of the broad mesial band of dark brown which characterizes the latter species.

LASIOCAMPA, Schrank.

176. *L. viridescens*, sp. nov. ♂. Culmen of antennae pale yellow; setae dark brown; body olive-green throughout with the end of the abdomen tufted with reddish hair. Upper side: Primaries olive-green clouded with reddish-brown on the costa and along the outer margin, traversed by a sub-basal and geminate transverse median brown line. There is at the end of the cell a small linear

brown discal dot. The outer third of the wing is ornamented by an irregularly curved and denticulate series of lilacine-brown markings, which are immediately followed externally by a pale green band conformed to the outer margin of these darker markings. The secondaries are brown, darker at the base, where they are heavily clothed with hair. The fringes on the secondaries are narrow and uniformly pure white. On the under side both wings are brown laved on the costae with pinkish. The marks of the upper surface of the primaries reappear indistinctly on the lower side. The secondaries have a dark pinkish-brown incomplete transverse line running from the costa and terminating about the middle of the cell. The outer margin is grayish-white. The fringes are white as upon the upper side. Expanse, 43 mm.

There is a specimen of this species unnamed in the collection of Mr. Herbert Druce of London.

177. *L. immunda*, sp. nov. ♂. Upper side of thorax and abdomen brown, the thorax somewhat hoary. The under side of the body and the legs paler brown. The upper side of the primaries is of the same color as the thorax shading into pale hoary-brown on the outer margin. There is a small silvery dot at the end of the cell. The primaries are crossed by obscure dark brown geminate sub-basal and median transverse bands. There is a submarginal series of sinuous and denticulate narrow brown lines. The secondaries are pale at the base, inclining to ferruginous, with the outer margins broadly brownish-fuscos. On the under side, both wings are pale brownish-fuscos; both are crossed by obscure and diffuse transverse median bands.

♀. The female differs from the male in having the tips of the patagia and inner margin and outer angle of the primaries laved with pale ochraceous. There are also a few obscure whitish submarginal lines

below the apex. On the under side both wings are dark fuscous with no traces of the transverse median bands. Expanse, ♂ 58 mm.; ♀ 75 mm. Habitat Kangwé and Benita.

This species differs somewhat in the ground color. Some of the males before me are much paler than the type.

178. *L. leucophaea*, sp. nov. ♂. Front, collar, and thorax dark vandyke brown; upper side of abdomen paler, inclining at anal extremity to hoary-gray. The legs and lower side of thorax and abdomen dark vandyke brown. Upper side: The primaries at the base are dark vandyke brown marked with a few bright ferruginous scales.

The outer margins are lilacine-gray. There is a small silvery dot at the end of the cell. The wing is further ornamented by geminate sub-basal and geminate transverse median angulated lines of obscure blackish and a submarginal series of pale ochraceous denticulate lines running from the apex to the inner margin before the outer angle. The secondaries are broadly vandyke brown on the costa with the remainder of the wing uniformly pale vandyke brown, shading into grayish on the outer margin. Under side: Both wings are uniformly pale grayish-brown. The secondaries have the fringes, which are narrow, pale gray, and the inner margin a trifle lighter than the rest of the wing. Expanse, 48 mm.

179. *L. lutescens*, sp. nov. ♂. Allied to the preceding species, from which it may be distinguished by its uniformly smaller size, warmer coloration, and the invariable presence of a broad patch of yellow on the inner margin near the outer angle and a smaller patch of yellow near the base about the origin of the first median nervule; also by the invariable presence of several silvery white lunulate markings on the primaries below the apex; otherwise this species does not materially differ from the preceding.

♀. The female is marked almost precisely like the male, but is much larger, the prevalent color being a warm pinkish-brown. Expanse, ♂ 45 mm.; ♀ 65 mm.

I have a good series of this species as larva. They emerged from the cocoon in the latter part of August and early September, having pupated between July 28th and August 17th. I shall in a future paper furnish a full description of the larvae.

180. *L. minima*, sp. nov. ♂. Front, collar, and upper side of the thorax warm reddish-brown. Upper side of abdomen pale pinkish-brown; legs and under side of the body pale pinkish brown, the anterior margins of the legs being marked with dark brown. Upper side: The primaries are pale pinkish-brown of the same color as the upper side of the abdomen with a dark brown band of the same color as the upper side of the thorax extending obliquely from the costa at the base to the outer angle. The apical third of the wing below the costa is clouded with the same dark brown color. There is a small silvery spot at the end of the cell, and very narrow and obscure angulated transverse basal, median, limbal, and submarginal lines. The secondaries are pale pinkish brown of the same shade as the upper side of the abdomen and have an obscure incomplete transverse median line on the costa. On the under side, both wings are pale pinkish-brown, the dark lines of the upper surface reappearing very faintly and obscurely upon this side. Expanse, 30 mm.

SATURNIIDAE.

CYRTOGONE, Walk.

181. *C. lichenodes*, sp. nov. ♂. Front and collar dark brown; patagia vandyke brown sprinkled with hoary scales. The middle of the thorax and the upper side of the abdomen are whitish, hoary, marked with a line of black spots on the dorsal line

of the abdomen, and by a lateral row of similar spots on either side of the abdomen above the spiracles. The pectus and legs and the lower side of the abdomen are rich dark brown. The tarsi are ringed with pale yellowish. Upper side: The primaries are olivaceous-gray, shading at the apex and on the outer margin near the middle into pale ochraceous. They are profusely sprinkled with transverse linear greenish-gray striae. There is an interrupted sub-basal line crossing the lower end of the cell and curving outwardly to near the middle of the inner margin. This line is rich velvety black. The outer angle and the apical third of the wing are clouded with vandyke brown and marked by exceedingly intricate black curved zigzagged submarginal lines. The secondaries at the base and on the costa are vandyke brown, shading into pinkish near the costa. The outer margin and the inner margin are broadly vandyke brown marked with a multitude of minute blackish striae and spots. A zigzag black line runs from the inner margin above the anal angle toward the outer margin. On the under side, the primaries have the base and the inner margin broadly laved with pink; the costa, the apical third, and the outer margin pale fuliginous dotted and streaked with exceedingly intricate spots and lines of blackish, with two or three silvery white dots upon the costa near the middle. The secondaries have the same color and style of marking as the apical third of the primaries. The general effect of the marking and coloration strongly suggests some forms of lichens, hence, the specific name. Expanse, 58 to 65 mm. Habitat Kangwé and Benita. Taken in the month of January.

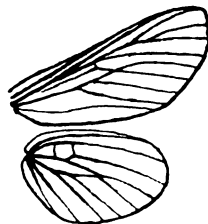
Mr. Kirby in his synonymical catalogue refers *Cyrtogone*, Westw., to the Pinaridae, but without propriety. I have carefully denuded the wings of a specimen of the above species, which I compared with the types of the genus in the British Museum and find the neururation to be strictly Saturniid.

Westwood was right in his location of the genus. It has nothing in common with *Pinara* or *Gonometa*, the typical genera of Mr. Kirby's group.

ARBELIDAE.

LEBEDODES, gen. nov.

Allied to *Encaumaptera*, Hpsn. The palpi minute, porrect; antennae of male relatively short, bipectinated to tips, the branches gradually diminishing in length from the base to the tip; legs hairy; tibiae with long terminal spurs. Fore wings with veins seven, eight, and nine stalked together. Hind wings with no bar between vein seven and eight; vein eight long running nearly parallel to the costa as far as the apex; the areole is divided in the middle by a narrow upright bar; veins three and four from the end of the cell; veins five and six from the upper and lower angles of the areole. Type *L. cossula*, Holl.



Neururation of *L. cossula*, Holl., ♂ †

182. *L. cossula*, sp. nov. ♂. Extremity of abdomen projecting for half its length beyond the inner margin of the secondaries. Front and collar pale mouse color; patagia dark blackish-brown, margined internally by mouse color; upper side of thorax mouse color; upper side of abdomen mouse color inclining towards the anal extremity to pale ochraceous and ornamented on the dorsal line immediately back of the metathorax by a large patch of brown, or blackish hairs.

The under side of the body and the legs are mouse color. The primaries and the secondaries on the upper side are mouse color, shading slightly on the inner margin into brownish. The inner margin from the base to the middle below vein one is dark, blackish-brown. The wings are crossed by a number of brownish transverse striae and marked on the outer third by a straight transverse brown line running from the costa two-thirds of the distance from the base to the outer angle, where it unites with a similarly colored curved submarginal brown line. The secondaries are marked on their inner two-thirds by numerous, narrow, transverse brown striae. On the under side, both wings are paler than on the upper side and the markings of the upper surface faintly reappear. Expanse, 50 mm.

METARBELA, gen. nov.

Allied to *Arbela*, Moore, but differing in the following particulars: The antennae are relatively shorter than in the genus *Arbela*; the primaries have a bar between veins nine and ten a little beyond the origin of vein seven, which together with vein eight are emitted from vein nine. The existence of this bar results in the formation of a secondary cell beyond the true cell. In the secondaries, vein one has two branches, whereas in *Arbela* there are three; and veins six and seven are stalked, whereas in *Arbela* they spring directly from the cell. Type *Metarbela stivafer*, Holland.



Metarbela stivafer Holl., (Cf. Hampson, *Moths of India*, v. i, p. 315, for neuration of *Arbela*).

183. *M. stivafer*,* sp. nov. ♂. The palpi brown; front very light brown; collar and patagia darker brown; upper side of thorax and abdomen clothed with golden-ochraceous hairs; the lower side of thorax and abdomen covered with long silky pale ochraceous scales. The primaries on the upper side are pale ochraceous with the outer margin fading into pale cinereous. The fringes are a trifle darker than the marginal portion of the wing. The body of the wing below the cell and beyond it toward the outer margin is clouded with brownish irregular markings. On the lower margin a well defined silvery line runs from the base to the outer angle. This line is curved strongly beyond the base forming almost a semi-circle from the base to the origin of the first median nervule, and then runs along this nervule as a straight line to the outer angle. Midway between the outer angle and the origin of the median nervule a white silvery spot appears and is confluent with the silvery line on its lower side. The lower margin of this silvery line is sharply defined by dark brown. The secondaries are uniformly very pale fuscous. On the under side, both wings are pale fuscous. Expanse, 25 to 30 mm.

I have a series of sixteen males of this species, but no females. I give it its specific name from a fancied resemblance to the outline of a plough-tail which the silvery marks upon the primaries present when viewed from in front.

ADDENDA TO BOMBYCIDAE.

ARCTIIDAE.

AUTOMOLIS, Hübn.

184. *A. Ehrmanni*, sp. nov. ♀. Antennae black; palpi and front crimson; collar bluish-green margined above with crimson; patagia crimson; upper side of thorax crim.

* *stiva* = a plough-tail; *ferre* = to bear.

son; upper side of abdomen with the somites bluish-green, heavily bordered on their hind margins with crimson. The lower side of the thorax and abdomen is crimson with the legs bluish-green. The primaries on the upper side are smoky-brown with the outer angle laved with ferruginous. There is a subtriangular hyaline spot in the cell on its upper margin before the discocellulars. There is a subovate larger hyaline spot below the cell near the origin of the first median nervule and a curved transverse series of four hyaline spots beyond the cell, the largest situated between veins five and six. The secondaries are uniformly bright orange-red. On the lower side, the primaries have the costa crimson and the inner margin broadly orange-red, shading upwardly into crimson with the apical half maroon. The secondaries are as on the upper surface. Expanse 70 mm. Habitat Liberia.

I name this magnificent species in honor of Mr. George Ehrmann, of Pittsburgh, whose interest in entomological matters is well known, and to whom I am indebted for the type.

LIPARIDAE.

AROA, Walk.

185. *A. omissa*, sp. nov. ♂. Body and appendages argillaceous; abdomen with a number of small tufts of black hairs on the dorsal line. Primaries argillaceous sprinkled with minute darker scales, with a black sub-basal dot near the costa, a large subquadrate black spot at the end of the cell, and above it on the costa two small subtriangular black spots. The secondaries are creamy-white with a dark gray discal spot and a series of similar transverse spots near the anal angle. On the under side, both wings are creamy-white, both have conspicuous gray, discal spots, and the markings of the secondaries near the anal angle reappear from the upper side. Expanse, 22 mm.

NOTODONTIDAE.

DESMEOCRAERA, Wallengr.

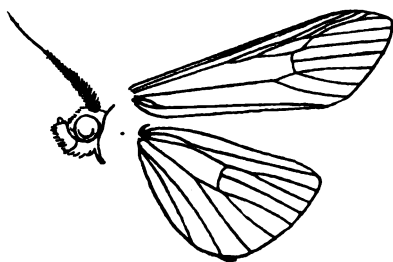
186. *D. (?) hinnulla*, sp. nov. ♂. Front brownish; upper side of thorax and abdomen pale greenish-brown with some dark spots upon the dorsal line of the abdomen; legs brown; under side of abdomen pale fawn. Primaries dark wood-brown interrupted by a curved crenulate narrow greenish-yellow transverse limbal band about the middle of which a narrow greenish-yellow ray reaches outwardly to the margin. On either side of this pale band are two very fine dark brown lines, conformed to the convolutions of the band. In addition the wing is ornamented by a very fine curved and denticulate basal and sub-basal line. There is a linear dark brown discal mark at the end of the cells. The fringes are pale greenish-gray minutely checkered with dark brown at the tips of the nervules. The secondaries are uniformly fuscous. The under side of both wings is fuscous, the primaries paler on the costa and traversed by an obscure, curved transverse limbal band. Expanse, 34 mm.

I refer this inconspicuous and obscurely colored bombycid provisionally to *Desmeocraera*, to which it apparently comes nearer than to any other genus known to me.

SCRANCIA, gen. nov.

Closely allied to *Gargetta*, Walk., from which it differs in that the antennae in the male are simple from beyond the middle to their tip, the pectinations being confined to the basal half (whereas in *Gargetta* they extend to the tip); in the female the pectinations at the base are almost obsolete. Furthermore, in the primaries veins 10 and 11 have their origin relatively nearer the base of the cell than in *Gargetta*, and the areole at the upper angle of the cell is much larger. The brush of hairs at the basal extremity of the inner margin of the primaries, which is characteristic of *Gargetta*, is

wanting. The primaries are relatively longer and more sharply produced, and the abdomen is relatively longer. (Cf. Hampson, Fauna of British India, Moths, v. i, p. 135, for neurulation of Gargetta.). Type *S. modesta*, Holland.



Scraucia modesta, Holl., ♀. (See plate 17, fig. 33.)

187. *S. modesta*, sp. nov. ♂. Lower side of palpi and collar pale fulvous; front paler; culmen of antennae pale grayish; setae testaceous; patagia hoary-gray; abdomen above and below together with the legs obscure fuscous-ochraceous. The primaries are gray showing a lilacine reflection on the inner and outer margins. At the base they are clouded with brownish, and are crossed by obscure geminate transverse basal, transverse median, and transverse limbal zigzag brown lines, the spaces between which are slightly paler than the body of the wing. On the inner margin, where the transverse limbal band terminates, there is a dark brown dot. Beyond the transverse limbal line, the neurulations are marked with narrow blackish rays, each interrupted on the middle by a small white dot. There is an angulated submarginal series of obscure grayish lines. The margin is accentuated on the interspaces by brownish linear dots. The fringes are uniformly brown. At the end of the cell, there is an obscure brownish discal mark crossed by two narrow parallel transverse darker lines. The secondaries are uniformly pale fuscous shading into creamy on the costa. On the under side both wings are dusky, traversed

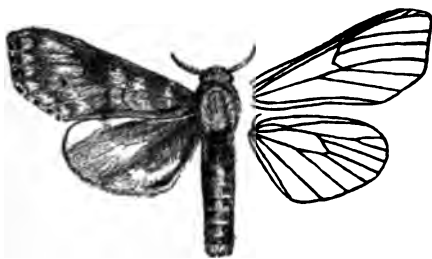
by incomplete transverse median, transverse limbal, and transverse submarginal bands of brown.

♀. The female is like the male save in the respects pointed out in the description of the genus. Expanse, ♂ and ♀, 48 mm.

CATARCTIA, gen. nov.

Palpi hairy, porrect, compressed; second joint long; third joint obsolescent and almost concealed by the hairy vestiture at the extremity of the second joint. Antennae short, bipectinated to the tips; setae in the female somewhat shorter than in the male. Legs of the male very hairy; of the female less hairy. The tibiae of the second pair are armed with a terminal spur; of the third pair armed with a subterminal and double terminal spurs. The primaries of the male are produced, with the costa rounded before the apex; apex truncate; outer margin produced at second median nervule, the margin forming an obtuse angle at this point; inner margin nearly straight. Secondaries suboval with all the margins evenly rounded. In the primaries, vein five springs from the upper discocellular one-third of the distance above the point at which it describes an angle directed inwardly with the lower discocellular. Vein seven is emitted from vein ten beyond the cell. Veins eight and nine are very short, stalked, the stalk being emitted from vein ten before the apex. Vein eleven is emitted from the cell near its upper angle. In the secondaries, vein one has two branches; veins six and seven are stalked; vein eight converges beyond its origin toward the cell, and then diverges widely. Type *C. (Arctia?) divisa*, Walker. (Cf. Walker's List, v. iii, p. 765.)

Walker described two insects under the name *Arctia divisa*, one an Indian insect, which is identical according to Kirby with *Arctia leopardina*, Koll. The other insect, which Walker referred with doubt to the genus *Arctia*, was from Sierra Leone. I have examined Walker's type, which is a male, and have compared it with specimens in my



Cataractia divisa, Walk., ♂.

collection. The female is in the collection of Mr. Herbert Druce of London, and is also represented in my collection by numerous specimens. The insect is a true notodont, as is shown by the neururation.

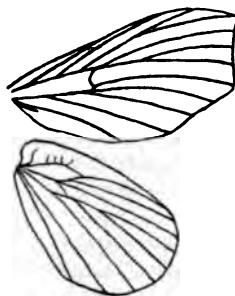
188. *C. divisa*, Walk. ♀. Differs from the male in the much broader expanse of the primaries, and in the almost complete obscuration of the transverse lines and markings of the primaries which appear in the male. The primaries in the case of the female are almost uniformly dull fawn on the upper surface, and are marked with a minute black spot at the base and similar minute black spots on the margin upon the intraneural interspaces. The secondaries are broadly pink, except upon the costa, where they are pale whitish fawn. On the under side, the primaries are broadly pink with the margins narrowly fawn. The secondaries are as in the male, but more broadly laved with pinkish.

LASIOCAMPIDAE.

PRODONESTIS, gen. nov.

Closely allied to *Odonestis*, Germ., from which it differs in the form of the primaries, which do not have the outer margin evenly rounded as in *Odonestis*, but produced at the outer extremity of the lower radial nervule. Furthermore, in the secondaries veins three, four, and five spring from a common stalk,

whereas in *Odonestis*, they spring directly from the cell. The accessory costal veinlets in the secondaries are few and incomplete, none of them reaching the costal margin, whereas in *Odonestis* they are well defined and reach the costal margin. The palpi are also much shorter than in *Odonestis*, scarcely being produced beyond the front. The female is much larger than the male. The antennae in both sexes diverge widely and are then bent backward about one-third of the distance from their insertion. -Type *P. fulva*, Holland.



Neururation of *Prodonestis fulva*, Holl., ♂. (Cf. Hampson, *Moths of India*, v. i, p. 425, for neururation of *Odonestis*.)

189. *P. fulva*, sp. nov. ♂. Lower side of palpi and antennae pale fulvous; upper side of thorax and legs moderately dark fulvous; lower side of thorax and entire abdomen pale fulvous. The upper side of the primaries is fulvous, slightly paler than the upper side of the thorax, and fading into pale fulvous-cinereous on the outer margin. There is a bright elongated discal cluster of silvery white scales at the end of the cell. The middle of the wing is clouded from the costa to the outer angle by dark brown. A similar patch of clouding covers the apex and does not quite reach the outer margin. Between these dark cloudings there is a narrow clouded band running from the costa transversely toward the outer margin, gradually

THE PRIMITIVE NUMBER OF MALPIGHIAN VESSELS IN INSECTS.—V.

BY WILLIAM MORTON WHEELER, PH.D., CHICAGO, ILL.

NEUROPTERA. Leon Dufour*, Frey and Leuckart†, v. Siebold‡ and Schindler§ have shown that members of this order have either 6 or 8 Malpighian vessels. The imaginal *Sialis* has 6 vessels and the same number of discrete proctodaeal diverticula is established in the embryo, as I have observed in *S. infumata*. In what I take to be the young larva of *Corydalis cornuta* there are also 6 vessels but in other much larger larvae (possibly belonging to the genus *Chauliodes*) I find the unusual number 7. This insect, therefore, constitutes a transition to the forms with 8 vessels, such as *Myrmeleon* and *Hemerobius*.

PANORPATA. The Scorpion flies (*Panorpa*) agree with *Sialis* in possessing 6 vessels.

TRICHOPTERA. Patten || has shown that the embryo *Neophylax concinnus* develops 6 Malpighian vessels as discrete proctodaeal diverticula. This number seems to be retained throughout life by all the species of the order.

* l. c. p. 505.

† l. c. p. 101.

‡ l. c. p. 627.

§ l. c. p. 628.

|| The development of phryganids, with a preliminary note on the development of *Blatta germanica*. Quart. Journ. micr. sci. vol. xxiv, 1884, p. 590.

COLEOPTERA. Schindler* makes the following general statement in regard to this order: "Vier Malpighi'sche Gefässe finden sich durchgehends bei den Pentameren, wogegen den Heteromeren, Tetrameren und Trimeren stets sechs zukommen." This assertion appears to require some qualification, since the Pentameron *Hydrophilus* has 6 Malpighian vessels according to Vangel† while the Heteromeron *Sitaris* has only 4 according to Beauregard.‡

These are very briefly the facts derived from a study of the embryo: in the greater number of forms the vessels arise as 6 discrete diverticula of the hind-gut. This has been shown for *Doryphora* by myself§, for *Melolontha* by Voeltzkow || and for *Hydrophilus* by Heider.¶ In the embryo

* l. c. p. 629 (foot note).

† Beiträge zur anatomie, histologie u. physiologie des verdauungsapparates des wasserkäfers (*Hydrophilus piceus*, L.) Nat. hefte. Pest. bd. 10, 1886.

‡ Recherches sur les insectes vésicants. i partie, anatomie. Journ. anat. phys. Paris. 21. Année 1885-1886.

§ The embryology of *Blatta germanica* and *Doryphora decem-lineata*. Journ. morph. vol. iii, no. 2. 1889.

|| *Melolontha vulgaris*. Ein beitrug zur entwicklung im ei der insecten. Arb. a. d. zool. zoot. inst. im Würzb. bd. ix. heft 1. 1889. (Plate v. figs 1, 2 & 13.)

¶ Die embryonalentwicklung v. *Hydrophilus piceus*, L. i. theil. Jena. 1889.

Dytiscus fasciventris I find only 4 vessels, and this number is retained in the imago.

Melolontha vulgaris deserves special mention, as it shows that the tetranephric is a modification of the hexanephric condition. Voeltzkow, as I have said, found 6 Malpighian vessels in the embryo of this Scarabaeid, whereas writers on the adult and larva describe only 4. *A pair of vessels must, therefore, be suppressed during post-embryonic development, presumably in early larval life.* The bearing of this fact on the tetranephric condition of *Dytiscus* is obvious; we have only to suppose that the tendency to suppress a pair of vessels has been carried back into early embryonic life.

LEPIDOPTERA. Schindler* and Cholodkowsky† have given us a considerable body of facts on the number and disposition of the Malpighian vessels in the Lepidoptera. The embryonic development of the tubules was elucidated by Hatschek‡, as long ago as 1877. "Wir finden" says this investigator, "im stadium C schon 6 Malpighi'sche drüsen, jederseits drei, die nach hinten zurückgebogen, rings um den hinterdarm auf dem querschnitte sich zeigen (figs. 3 and 4, pl. iii). Die drei Malpighi'schen drüsen jeder seite münden durch ein gemeinschaftliches aufangsstück in das blinde ende des hinterdarmes." Hatschek's figures show the arrangement of the

vessels to be the same as in the larva and imago. My own observations on embryos of *Platysamia cecropia* confirm his account.

With the exception of a very few species, to be considered presently, all Lepidoptera have 6 Malpighian vessels. They are not discrete diverticula of the hind-gut, but on either side two of the vessels are united by a common trunk to the third, so that there is only one opening into the rectum on either side. This antler-like system appears to arise in the following manner: a hollow bud grows out from the proctodaeum and bifurcates; then one of the two vessels thus formed bifurcates, while the other simply lengthens. Cholodkowsky calls the duct leading into the rectum the "tronc basilaire," the one uniting the two terminal vessels the "tronc secondaire." He gives an extended account of the relative variations in length of the two trunks throughout the various families of Lepidoptera. The variations are sometimes considerable, but the number 6 is rigorously adhered to. The only exceptions observed by Cholodkowsky are the Pyralid *Galleria* and certain Tineids.

In *G. melonella* the Malpighian vessels resemble two trees "richement et irrégulièrement ramifiés." This peculiar form is so strikingly unique that we may put it down without hesitation as a secondary development. Cholodkowsky finds that the larva of *Tinea biselliella* has the typical 6 Malpighian vessels; but these break down during the pupal stage and in their stead arises

* l. c. p. 646 et seq.

† l. c.

‡ Beiträge zur entwicklungsgeschichte der Lepidopteren. Naumburg, 1877, p. 19.

a single pair of imaginal tubules. The Russian investigator has established the same interesting fact for *Tinea pellionella* and *Blabophanes rusticella*.

On these cases, avowedly exceptional even among Tineidæ, Cholodkowsky bases his dinephric hypothesis. The return in the imago to an apparently simpler condition of the Malpighian vessels than obtains in the larva, is regarded by him as a kind of atavism. To characterize this form of reversion, which is regular and periodic in its occurrence, he introduces the term "atavisme périodique." But it is clear that this atavism, if atavism it be, must extend to ancestral conditions exceedingly remote—postulating 2 as the primitive number of Malpighian tubules in Arthropods—since the number 2 occurs only in very few insects, and only in cases where a secondary reduction from a greater number furnishes a more plausible explanation (Coccidae).

Cholodkowsky assumes that the basal

trunk represents the primitive Malpighian vessel. I would regard both it and the secondary trunk as comparatively recent acquisitions, since I find it difficult to see, on Cholodkowsky's supposition, why the number of vessels should be so constant throughout the order and at the same time agree with the number observed in the older and more primitive orders (Orthoptera, Neuroptera, Panorpata). Moreover, it is generally admitted that the Trichoptera stand very near the hypothetical ancestral Lepidoptera, and it has been shown that both the embryo and imaginal Trichoptera have 6 discrete Malpighian tubules. On Cholodkowsky's supposition it would be necessary to regard the urinary vessels in the lower orders as less primitive than those of the Lepidoptera, an assumption which certainly has very little in its favor when we stop to consider the extent to which other organs have been modified in the Lepidoptera.

ENTOMOLOGICAL NOTES.—The 13th part of Kolbe's Einführung in die kenntnis der insekten completes the first volume of the work, and with it the account of the morphology and physiology of insects; it concludes with a bibliography of the organs of generation. Although only two of the twelve main divisions contemplated have been treated, another volume will doubtless complete the work.

In the Contemporary review for September, Weismann has a deeply interesting article on the All-sufficiency of natural selection, supporting his well known views of the intransmissibility of acquired characters, and in which his main arguments are drawn from the study of ants. "All-sufficiency" is a strong term, and if it were generally con-

ceded would prove a distinct bar to progress; working hypotheses, on the other hand, lie at its very foundation.

In recent information regarding the Cambridge botanic garden given in the last number of the Harvard graduates magazine, Prof. G. L. Goodale speaks of the damage done by white ants as follows: "In one part of the wall the ants had taken away nearly all the wood, leaving the painted surface untouched and apparently sound. From this wall they had made their way into floor timbers hitherto supposed to be free from any pest."

Mr. Townsend (Ins. life, 5: 317) identifies the oestrid larva described by him in the current volume of Psyche, p. 298, as *Cuterebra fontinella* Clark.

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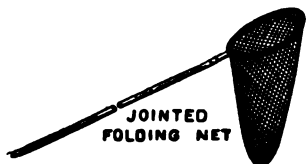
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(REDUCED NEARLY ONE-HALF.)



AFRICAN NOCTUIDS. (Holland,)

(NATURAL SIZE.)

PSYCHE.

THE PRIMITIVE NUMBER OF MALPIGHIAN VESSELS IN INSECTS. — VI.

BY WILLIAM MORTON WHEELER, PH.D., CHICAGO, ILL.

HYMENOPTERA. According to Schindler the number of Malpighian * vessels in the imagines of Hymenoptera varies from 12 to upwards of 150. The number 12 was observed in *Myrmica*, the greater number in *Apis*.† In certain ants according to Adlerz ‡ a very small number is observed, the neuter of *Tomognathus* having only 6 vessels.

Embryology shows conclusively that none of these numbers (excepting perhaps that of *Tomognathus*) are to be regarded as primitive. Bütschli§ found only 4 vessels in the embryo of the honey-bee (*Apis mellifica*) and Carrière|| gives the same number for

the wall-bee (*Chalicodoma muraria*). This number is retained during larval life, as has long been known (see Leuckart's figure in Lang's *Vergleichende anatomie*, p. 476). According to Carrière the Malpighian vessels of *Chalicodoma* arise as two pairs of invaginations on the caudal plate (which is an extension of the ectoderm behind the eleventh abdominal segment). In his first account they are said to arise "ehe die einsenkung des hinterdarmes beginnt; ihre mündung wächst mit dem boden bez. dem rande des hinterdarmes nach dem hinterende des mitteldarmes zu."

Adlerz* claims that the larvae of ants have 4 Malpighian vessels. It is more than probable that this is the number formed in the embryo.

It appears that we have no cases among Hymenoptera with 6 Malpighian vessels in the embryo and only 4 in the larva. On the supposition that 6 is the original number we must therefore conclude that a pair of tubules has been suppressed in the ancestral Hymenoptera. It must, however, be borne in mind that we have no observations on the embryonic development of the excretory

* l. c. p. 635 et seq.

† The numbers given by Schindler run as follows
Formicidae.

Myrmica 12.

Formica pubescens 25-30.

Formica rufa 16.

(Adlerz gives 20 for *F. rufa* and *Camponotus*.)

Ichneumonidae.

Microgaster 15 (Dufour).

Chelonus, more than 20 (Dufour).

Ophion merdarius, about 40.

Some other *Ichneumonids* more than 40.

Cynipidae, at most 20-25.

Chrysididae, about 100.

Crabronidae,

Vespidae,

Apidae,

} more than 100.

‡ *Myrmecologische studier*. 2. Svenska myror och deras lefnadsförhållanden. Bih. svenska. vet. akad. handl. bd. 11, no. 18, 1887.

§ l. c.

|| Die entwicklung der maurbiene (*Chalicodoma muraria*, Fabr.) im ei. Arch. f. mikr. anat. bd. 35, heft 2, 1890.

* l. c.

organs of the Tenthredinidae, a family which promises to throw considerable light on the ancestral peculiarities of the order.

DIPTERA. In these very highly modified insects the number of Malpighian vessels shows a constancy that contrasts strikingly with the variations occurring in the Hymenoptera; with very few exceptions the Diptera have in all their stages only 4 urinary tubules. Still there seems to be considerable variation in the manner of their opening into the intestine. Schindler* claims that in Aphaniptera, Pupipara, Tipulidae, Asilus, Haematopota, Eristalis, each of the vessels has a separate opening. In Hippobosca, Musca, Sarcophaga, Anthrax, Conops, Oestrus and Syrphus, the vessels are united in pairs and open by means of two ducts, a condition which reminds one of the Gryllidae. In Tipula and Ctenophora the terminal ends of the vessels are fused in pairs.

There is, I believe, some evidence in favor of the view that 4 is not the primitive number of vessels in the Diptera, and that there has taken place throughout the group a reduction similar to what was observed in Melolontha. I base this conclusion on an observation first made by Voeltzkow† and more recently confirmed by Graber.‡ Voeltzkow describes and fig-

ures 3 pairs of tubular diverticula to the proctodaeum of Musca. Two of these pairs he designates as Malpighian vessels, to the third pair he refers as "neuaufretende gänge." Graber's fig. 76, taf. vii, shows that one of the "gänge" arises between the two Malpighian vessels on either side. Why may not this median pair of diverticula, which are apparently purely embryonic structures, represent a third pair of Malpighian vessels?

There is also another fact which vaguely points to a primitively hexanephric condition in the Diptera. I allude to Culex and Psychoda, forms which, according to Dufour* Raschke† and Schindler‡ have five Malpighian vessels. This number, which, to my knowledge, has been observed in no other insects, may have originated from the hexanephric condition either by the suppression of a single tubule or by the fusion of a pair of tubules into one. That the latter is probably not the case follows from Schindler's statement: "Dass das 5 gefäss nicht etwa das product der concrescenz zweier gefässe ist, scheint mir zur genüge daraus hervorzugehen, dass ich bei kleinen und kleinsten larven, bei der puppe und dem imago von *Culex pipiens* und *C. annulatus* immer 5, in ihren längs- und breite-dimensionen einander vollständig

* l. c. p. 642 et seq.

† Entwicklung im ei von Musca vomitoria. Arb. zool. zoot. inst. Würzb. bd. 9, heft. 1, 1839, p. 32.

‡ Vergleichende studien über die embryologie der insecten u. insb. d. Musciden. Denkschr. math. wiss. classe k. akad. wiss. Wien. bd. 56, 1839, p. 37-38.

* Mémoire sur les vaisseaux biliaires ou le foie des insectes. Ann. sci. nat. 2^e sér. tom. xix, 1843, p. 166.

† Die larve von Culex nemorosus. Ein beitrage zur kenntniss der insecten-anatomie u. histologie. Arch. naturg. 53 jahrg. 1837.

‡ l. c. p. 642.

gleiche harngefäße vorfand." It is perhaps worthy of note that this pentanephric condition obtains in Diptera which are by common consent among the most ancient and primitive of the order.

The foregoing remarks may be summarized as follows:—

1. It is very probable that the so-called Malpighian vessels of Crustacea and Arachnida are not the homologues of the *vasa Malpighi* of the Eutracheata (Insects and Myriopods).

2. The Malpighian vessels of the Eutracheata arise as paired diverticula of the hind-gut and are, therefore, ectodermal.

3. In no insect embryo are more than 6 vessels known to occur; although frequently only 4 are developed.

4. The number 6 occurs either during embryonic or post-embryonic life in members of the following groups: Apterygota, Orthoptera, Corrodentia, Neuroptera, Panorpata, Trichoptera, Coleoptera, Lepidoptera and Hymenoptera.

5. The number 4 seems to be typical for the Corrodentia, Thysanoptera,

Aphaniptera, Rhynchota, Diptera and Hymenoptera.

6. The embryonic number in Dermaptera, Ephemeridea, Plecoptera and Odonata has not been ascertained, but will probably be found to be either 4 or 6.

7. There is evidence that in at least one case (*Melolontha*) the tetranephric is ontogenetically derived from the hexanephric condition by the suppression of one pair of tubules.

8. It is probable that the insects which never develop more than 4 Malpighian vessels have lost a pair during their phylogeny.

9. The post-embryonic increase in the number of Malpighian vessels in some orders (Orthoptera, Odonata, Hymenoptera) is secondary and has apparently arisen to supply a demand for greater excreting surface.*

* There is a curious analogy between the excretory organs of these insects and the mesonephros of some vertebrates, where a second, third, etc., generation of tubules is added to the primitive metameric series. When the embryonic number of Malpighian vessels persists in insects, the demand for greater excreting surface is supplied by a lengthening of the individual vessels.

NOTE ON A SCUTELLERID ON NATIVE TOBACCO IN ARIZONA.

BY C. H. TYLER TOWNSEND, KINGSTON, JAMAICA.

At Cedar Ranch, Arizona, which is the half-way station on the stage route from Flagstaff to the Grand Cañon, I found on July 6, 1892, a scutellerid in numbers on a species of native tobacco, *Nicotiana* sp. probably *attenuata*. This locality is also called Hull Spring,

and is on the edge of the somewhat mountainous country which lies to the south of it, a more or less level plateau extending to the north between it and the cañon. The native tobacco upon which the insects were found grew in patches about the spring, which is

located a few hundred yards to the south at the base of the north slope of the wooded hills. The scutellerid was very numerous on the *Nicotiana*, and lives on the juices of the plant. About thirty adults were taken, but only one larva. This was the only larva seen at this date, but hundreds of the adults could have been collected. Some ants were observed, which appeared to linger about the scutellerids.

Specimens of the latter were sent to Mr. Uhler and Dr. Riley, and determined by them as *Corimelaena extensa* Uhl. This record is of interest as noting a scutellerid which affects *Nicotiana*. I know of no previous mention of a member of this family of insects living upon this plant.

The adult of *C. extensa* is shining black, with the hemelytra widely, almost wholly creamy on the sides. The larva is very similarly colored, being also black with a patch of creamy on the sides of body, the hemelytra being not yet developed. It may be more definitely described as follows:

Larva of *Corimelaena extensa*.—Length, $1\frac{1}{2}$ mm.; width, 1 mm. Body clothed somewhat sparsely with short pubescence. Head triangular in outline from above, narrower than thorax, shining black above and below, the usually invisible membranous neck-like portion which attaches the head to the thorax being pale or light colored. Eyes brownish.

Antennae pale-colored, pubescent, 4-jointed, last joint longest and stoutest, three basal joints nearly same length and size. Beak elongate, reaching beneath body as far back as origin of hind pair of legs, pale colored, 3-jointed, basal joint a little the longest, last two joints nearly the same length, the second joint a little stouter than the last. Thorax about one-third broader than head, shining black above and below. Legs pale colored, except femora which are mostly darker. Abdomen as wide as thorax, rounded behind, vaulted and convex, cistudinate (in the dried specimen), exposed and bare, widely shining black on the median portion longitudinally, narrowly so on the lateral edges, between the two with a lateral longitudinal stripe of creamy whitish which gradually narrows to a point posteriorly. Ventral surface of abdomen very concave, and showing same coloring. Scutellum and wings wholly undeveloped.

One specimen, July 6, on *Nicotiana*. Arizona.

In the adult the last joint of antennae is no longer nor larger than the preceding two joints, to each of which it is nearly equal. The legs are almost wholly blackish or brownish, except the tarsi and tips of tibiae. The beak is brownish and 3-jointed, antennae pale. Whole upper surface of head, thorax and scutellum is dark metallic green. Wing covers are extremely narrow, creamy except a narrow dark green line on inner edge which broadens at base.

A NEW ENTOMOLOGICAL JOURNAL.—The New York entomological society began early this year the publication of a quarterly journal, of which three parts have already appeared, extending to nearly 150 pages.

Most of the articles, as is fitting, bear particular reference to the insects of the neighboring region, and render the journal of special value in this respect; besides which are not a few papers of permanent interest.

(Continued from page 538.)

diminishing and terminating upon the third median nervule. There is an obscure irregularly curved sub-basal transverse line and a similar transverse limbal line which runs from the costa beyond the middle obliquely to the third median nervule about its middle, and then sweeps inwardly with three irregular scallops to about the middle of the inner margin. The secondaries are pale fulvous. On the under side, both the primaries and the secondaries are pale fulvous with obscure and incomplete geminate transverse limbal lines. The white spot at the end of the cell on the upper surface reappears indistinctly upon the lower side.

♀. The markings in the female sex are very much as in the male, with this difference that the white discal spot in the primaries is in all specimens before me, save one, replaced by a dark brown spot. In one case, the silvery-white scales reappear, but far more indistinctly than in any male. Expanse ♂, 50 to 65 mm.; ♀, 85 to 100 mm.

I have over forty specimens of this species, male and female, reared ex larva. I hope to be able to give shortly an account of the life history of the species.

PINARIDAE.

GONOMETA, Walk.

190. *G. brotoëssa*, sp. nov. ♂. Front, pectus, and upper side of thorax rich maroon; upper side of abdomen uniformly steely-blue; lower side of thorax and abdomen ferruginous. Primaries rich maroon with a silvery dot encircled by black at the end of the cell; a yellow subtriangular spot below the cell near the base. On the middle of the wing there are two obscure parallel zigzag blackish lines running from the apex diagonally to the middle of the inner margin. The secondaries have the costa dusky-ferruginous; the remainder bluish-black. On the under side, the primaries are maroon, heavily clouded

with blackish on the cell and middle area. The secondaries are colored much as on the upper side.

♀. The female has the body as the male, but much larger. The upper side of the abdomen is brilliant steel-blue with an orange colored tuft of hairs at the anal extremity. Both primaries and secondaries on the upper and lower sides are uniformly rich maroon. Expanse ♂, 65 mm; ♀, 95 to 100 mm.

There is less disparity between the sexes than is the case in some other species of the genus.

NOCTUIDAE.

GIGANTOCERAS, gen. nov.

Allied to *Risoba*, Moore. The palpi are not as closely compressed as in that genus; the second and third joints are longer, less hairy, and more attenuated than in *Risoba*. The antennae are very long. In *Risoba* they are not quite equal in length to the costa of the primaries; in *Gigantoceras*, they are from fully one-half to twice as long again as the costa of the primaries, and are directed forward. They are minutely serrated at the base. The legs are also relatively much longer than in *Risoba* and not so hairy. The tibiae of the third pair have a subterminal and two minute terminal spurs: in *Risoba* the spurs are prominent. The primaries are relatively shorter and broader than in *Risoba*. The neuration so far as I have been able to ascertain does not differ from that of *Risoba*. Type *G. solstitialis*, Holl.

191. *G. solstitialis*, sp. nov. ♂. Antennae one-half longer than the costa of the primaries, very slender; palpi and front fuscous; collar brown; patagia and upper side of thorax white; lower side of thorax and entire abdomen fuscous. The primaries are obscure fuscous with a dark brown apical patch, and the base and inner margin prevalently

clouded with the same color. The inner margin for one-third of the distance from the base is covered with silvery white scales. In the middle of this white longitudinal mass of scales is a minute brown spot. The secondaries are pale fuscous with the outer margins broadly blackish. The fringes of the primaries and the secondaries are light fawn and obscurely checkered with darker brown at the ends of the nervules. On the under side, both wings are pale fuscous with the neurations, an obscurely defined discal mark, and the margins from a little beyond the cell dark fuscous. The fringes are paler, and not checkered as on the upper side. Expanse, 30 mm.

192. *G. (?) geometroptera*, sp. nov. ♂. Antennae twice as long as the costa of the primaries. The primaries have the outer margin relatively longer and straighter than in the preceding species with the inner margin relatively shorter. The front is brown; the thorax on the upper side olivaceous-green; the upper side of the abdomen fuscous; the lower side of the thorax and the abdomen pale gray. The primaries are pale olivaceous traversed by geminate basal, sub-basal, median, and limbal transverse lines of darker olive-green; darkest in the region of the costa. The nervules at their extremities are marked with short blackish rays, and at the apex there is a series of similar blackish markings enclosing a wood-brown <-shaped apical patch. There is an obscure white spot in the middle of the cell surrounded by pale olivaceous, a linear discal mark at the end of the cell dotted at either extremity by dark brown, and beyond the cell an obscure annulus of pale olive-green, margined with darker olive. Near the outer angle there is a brownish patch of scales. Before the geminate sub-basal transverse line just above the inferior vein there is a small white dot. On the margins there are lunulate dark brown markings on the interspaces, and the fringes are pale. The secondaries are pale fuscous with

the margins broadly darker brown, and an obscure discal dot at the end of the cell. On the under side both wings are very pale fuscous with the neurations dark brown and distinctly defined upon the paler ground. A broad blackish incomplete band runs from the costa near the end of the cell to the origin of the lower radial nervule, coalescing on the costa and at the origin of the radial with a broad blackish outer marginal band, which sweeps inwardly to the point of union. Enclosed between these two markings is a large suboval whitish spot. The end of the cell in the secondaries is marked by a broad obscurely defined blackish spot, and the margins are broadly blackish. The fringes are whitish. Expanse, 33 mm.

The greater relative breadth of the wings in this species and the lack of a patch of raised scales on the inner margin of the primaries lead me to refer the insect with a little doubt to this genus. My specimen is unique and I do not care to dissect without more material.

METALEPTINA, gen. nov.

Allied to *Leptina*, Guen. The palpi are longer than in *Leptina*, and have the third joint long, aciculate, directed upward. The antennae are as in Guenée's genus. The legs are much more densely clothed with scales, especially the third pair, which have the tibiae very heavily clothed with long scales. armed with long spurs, two at the base and one just before it. The primaries are not as long relatively as in *Leptina*, and relatively broader. On the inner margin at the base, the primaries are clothed with a linear patch of long raised scales. The neururation of the primaries and secondaries is the same as in *Leptina*, so far as I have been able to ascertain by careful comparison, without making microscopic mounts of the wings. Type, *M. nigribasis*, Holl.

193. *M. nigribasis*, sp. nov. ♂. The lower sides of the palpi are pale fulvous-gray. The upper side of the palpi, the front, collar, patagia, and upper side of the thorax are blackish brown. The upper side of the abdomen is fuscous, darkest on the dorsal line. The under sides of the thorax and abdomen and the legs are pale gray. The primaries on the upper side are pale wood-brown with a pinkish reflection shading into darker brown toward the apex and the outer margin. The patch of raised scales on the inner margin at the base is dark blackish-brown like the costa. The primaries are traversed from the costa just before the apex to the middle of the inner margin by a narrow dark brown straight line, bordered externally by a paler parallel line. The secondaries are fuscous, darkest on the outer margins. On the under side the primaries are pale fuscous, with the costa and the middle area darker. The outer margin of this darker median area is sharply defined as a curved line, which is followed by a paler shade. The outer margin is darker, and at the end of the cell there is an obscure discal mark. The secondaries on the lower side are paler than the primaries and are traversed by an obscure curved transverse limbal line. The margins are obscurely bordered with darker fuscous. Expanse, 30 mm.

194. *M. albibasis*, sp. nov. ♂. Lower side of palpi pale ferruginous. Front, collar, patagia, upper side of thorax, and abdomen fawn; lower side of thorax and abdomen and legs very pale cinereous. The primaries on the upper side are pale wood-brown, or fawn, traversed from the costa before the apex to the inner margin two-thirds of the distance from the base by a narrow irregularly, and slightly curved darker line, bordered externally by very narrow paler lines. The raised patch of scales on the inner margin at the base is whitish defined on its upper margin by a darker shade which extends outwardly along the inner margin to the termination of

the narrow transverse limbal line. There is an obscure round dark spot in the middle of the cell, an obscure linear mark of the same color at its end. The secondaries are uniformly pale fuscous. On the under side, both wings are pale fuscous. The primaries have the middle area and the costa clouded with darker brown, the outer margin of this darker area being well defined against the paler marginal area. The fringes of the primaries are dark brown. The secondaries are traversed from the costa beyond its middle by a curved incomplete transverse limbal band of dark brown. The fringes of the secondaries are concolorous. Expanse, 25 mm.

195. *M. oblitteratu*, sp. nov. ♂. Head whitish. Collar, patagia, and upper side of thorax dark cinereous. Upper side of abdomen pale brown; lower side of thorax and abdomen with legs whitish. The primaries are pale ferruginous. At the end of the cell, there are two small spots of whitish raised scales margined with blackish. Beyond the cell there is a narrow and very obscure transverse limbal line, regularly curved outwardly, running from the costa before the apex to the inner margin two-thirds of the distance from the base. The patch of raised scales on the inner margin at the base is cinereous, defined on its upper side by a brownish spot. The secondaries are uniformly pale creamy, tinged on the outer margin with fuscous. On the under side both wings are shining creamy with the fringes of the primaries dark brown, and a faint brownish shade on the upper margin of the cell below the costa. Expanse, 30 mm.

DINOTODONTA, gen. nov.

Allied to *Dasunaga*, Moore. The palpi are short, ascending, compressed, scarcely reaching beyond the vertex; the third joint is very short, hemispherical; the second joint relatively very long. The antennae in the male are simple, slightly ciliated on the lower side

near the base, and three-fourths as long as the costa of the primaries. The legs are long, naked, the second pair with a long slender terminal spur, the third pair with double sub-terminal and double terminal spurs, likewise slender, the inner member of each pair being longer than the outer. The abdomen is much produced beyond the inner margin of the secondaries, slender, and lightly tufted with long hairs at the tip. The vestiture of the abdomen is smooth, appressed. The patagia are relatively long, covering the insertion of both wings. The primaries are narrow, elongated, slightly curved on the costa, evenly rounded on the outer margin, and bilobed on the inner margin, the first lobe being just beyond the base, the second about the middle of the wing. Beyond this second lobe, the inner margin of the wing is straight. The secondaries are subtriangular; the costa is arched beyond the base, pointed at the apex, nearly straight along the outer margin, and slightly curved on the inner margin. In the primaries the internal vein has two branches, the lower one extending from the base to the outer edge of the second lobe of the inner margin, the upper extending to the outer angle. The radial springs from the middle of the discocellulars. There is an areole at the upper angle of the cell, from which veins six to ten spring. Veins seven and eight are emitted from nine beyond the upper angle of this areole. Vein eleven is given off beyond the middle of the cell. Vein twelve is straight and terminates upon the costa three-fourths of the distance from the base. In the secondaries the inferior vein has two branches, the innermost terminating on the anal angle, the outermost widely separated from it, the outer margin being slightly lobed between the extremities of these veins. The radial is given off from the middle of the discocellulars, which form an angle with each other pointing inwardly. Veins six

and seven are stalked. Vein eight curves downwardly to the upper margin of the cell near the base, and then diverges widely and terminates upon the costa a trifle before the apex. Type *Dinotodonta longa*, Holl.

This genus shows in the neurulation affinity to the Notodontidae, but together with the two immediately subsequent genera is in my judgment more properly referred to the noctuids, the simple antennae and the long legs being more characteristic of the noctuids than of the notodonts, although the genus *Scrancia*, which I have referred to the notodonts, in its neurulation comes very near this and the two following genera.



Dinotodonta longa, Holl. ♂, ♀.

196. *D. longa*, sp. nov. ♂. Palpi, head, collar, and thorax dark brown; upper side of abdomen fuscous; lower side of thorax and abdomen and the legs paler. Primaries on the upper side pale vandyke brown, traversed by a broad band of dark vandyke brown beyond the middle, which is defined externally and internally by heavy dark brown lines, which are produced on the nervules, the outermost very irregularly curved and fusing with a dark brown ray, which extends from the apex inwardly. There is a dark vandyke brown basal shade bordered externally with a curved sub-basal dark line. The inner margin where lobed is dark like the basal area. The

DESCRIPTIONS OF NEW ACULEATE HYMENOPTERA.

BY WM. J. FOX, PHILADELPHIA.

Pisonopsis gen. nov.

Form stout; sculpture coarse; head as broad as or slightly broader than the thorax, in the ♂ it is distinctly broader; mandibles distinctly notched on outer margin; eyes reaching to the base of mandibles, their inner margins converging a little towards the vertex and rather strongly emarginate at about the middle, in the ♂ they are but slightly emarginate; ocelli round, regular and distinct placed in a triangle; antennae ample, placed immediately behind the clypeus; shoulder tubercles not reaching to tegulae; metathorax a little shorter than the dorsulum; marginal cell long, but not reaching beyond the tip of third submarginal, obtuse at tip, without appendiculation; three submarginal cells, the first more than two times longer than the other two combined, the second petiolated, generally though not always, receiving both recurrent nervures, third submarginal narrow, wider below than at the top; discoidal vein confluent with the interno-medial vein; stigma short, truncate at tip; legs very feebly armed, the anterior tarsi without comb, middle tibiae with a single strong spur at apex, tarsal claws entire; last dorsal segment of the ♀ with a distinct pygidial area, in the ♂ the last ventral segment roundly emarginate at apex.

From *Pison* it is distinguished by the emarginate mandibles, the last dorsal segment of ♀ with a pygidial area, its more robust form and its coarse sculpture. From the other *Larrid* genera that have the eyes emarginate, i. e. *Anlacophilus* and *Trypoxylon*, the form of the abdomen will at once separate it.

Pisonopsis clypeata. ♀.—Clypeus convex medially, with large, scattered punctures, produced anteriorly into a strong medial tooth, at the base of the tooth the clypeus is transversely impressed; front with close, rather coarse punctures, with a distinct, medial, impressed line; ocelli slightly pitted, forming an equilateral triangle; top of head and cheeks shining, more finely punctured than the front; first joint of flagellum a little shorter than the second which is longer than the third, dorsulum with distinct punctures, those on the anterior portion finest and closest; scutellum punctured like hind portion of dorsulum; metathorax on sides and posteriorly with coarse striations, the upper surface with a somewhat triangular enclosure, which is on basal portion obliquely ridged, on apical portion transversely ridged; legs strong, the tibiae and tarsi with a very few weak spines; wings subhyaline, iridescent, the apical margins darker, recurrent nervures generally received by the second submarginal cell; in one specimen the first recurrent nervure is confluent with the first transverse-cubital nervure; abdomen finely, though distinctly punctured, the second and third dorsal segments rather strongly transversely depressed basally; pygidial area triangular, finely and closely punctured; black, the abdomen rufous; sides of face, clypeus, sides of thorax more or less and the apical margins of abdominal segments 1-5, silvery. Length 9 mm.

♂.—Eyes scarcely emarginate within and converging but little towards the vertex; ocelli situated in a low triangle, the distance between the hind pair more than twice greater than the distance between them and

the nearest eye-margin; antennae shorter than in the ♀, joints 1-6 of the flagellum produced into a strong angle or tooth beneath, joints 1-4 much narrowed basally; from joint six the flagellum gradually tapers to the apex; apical portion of abdomen blackish; last ventral segment of abdomen roundly emarginate at apex. Length 7 mm.

Nevada (Morrison). Four specimens.

PLENOCULUS gen. nov.

Eyes within not emarginate, distinctly converging towards the clypeus; the ocelli round and prominent; antennae short and stout, originating immediately behind the clypeus; head transverse, wider than the thorax; outer edge of mandibles strongly emarginate; palpi rather prominent, the maxillary palpi 6-jointed, the labial palpi 4-jointed; in the ♂ the clypeus has on each extreme side a fringe of hairs as in *Cerceris*; pronotum lower than the level of the dorsulum; metathorax distinctly shorter than the dorsulum; legs stout, the femora narrower at apex than at the base; four hind tibiae and tarsi strongly armed with spines, those on the anterior tarsi forming a weak comb; tibial spurs large and strong, the hind tibiae two-spurred, the others with but one spur; tarsal claws long and slender, not toothed, in the ♂ much smaller; marginal cell at apex obliquely truncate, with a distinct appendiculation; three submarginals, of which the first is nearly twice as long as the other two combined, the second petiolate, the third is oblique and is slightly narrowed above, the first recurrent nervure received by the first submarginal cell near its apex, the second by the second submarginal cell between its middle and apex, the discoidal and basal nervure meet at a short distance from the apex of the submedian cell, this cell being therefore shorter than the median cell on the externo-medial nervure; stigma small, scarcely distinguishable from the costal nervure; abdomen shaped as in *Oxybelus*: last dorsal segment ♀ with a distinct pygidial area.

This genus seems to be most closely related to *Tachyrhynchus* Saussure from Australia; it is, however, different in the fact that it is not at all metallic in color, the head being broader than the thorax, the wide emargination of the mandibles, the narrow vertex. From *Bothynostethus* it is distinct by the eyes converging towards the vertex, the marginal cell with an appendiculation, and the hind femora being not broadened at the apex, etc.

It may be that this is the genus described by Patton, from New York,* but his description, "Second submarginal cell petiolate," is of no value as some half a dozen genera of the *Larriidae* possess that character. *Plenoculus* is also distinguished from *Sylaon* and *Solierella* in possessing a pygidial area and by the legs being strongly armed.

Plenoculus davisii. ♀. — Anterior margin of clypeus deeply incised, armed with five teeth on each side, the outer and inner tooth is generally the largest, the others being in some specimens indistinct; front very finely granulated, with a long, distinct, medial impressed line, which originates in a strong fovea, before the anterior ocellus and extends down between the base of the antennae; ocelli forming a triangle; on each side of anterior portion of vertex there is a curved furrow, running from each hind ocellus to the inner eye-margin; first joint of flagellum possibly a little shorter than either the second or third, which are a little longer than any of the following joints, except the last; dorsulum and scutellum with very fine, close punctures, both strongly convex; suture between dorsulum and scutellum strong; metathorax above very finely granulated, rather strongly furrowed down the middle, the extreme base generally with a transverse series of small fossae, sides and posterior face very finely striated; abdomen finely and closely punctured, the pygidial area triangular, with large, sparse punctures, its lateral ridges not well defined; black; clypeus,

* Entomological news, iii, p. 90.

except apex, tegulae, four anterior tibiae on outer side, the hind tibiae on outer side except apical portion, yellowish; tarsi and apical margins of the abdominal segments testaceous; wings hyaline, iridescent; nervures testaceous; apical abdominal segment more or less rufous; head, thorax and abdomen more or less covered with silvery pile, which is most dense on the face, clypeus, mesopleurae and metathorax. Length 5-6 mm.

VAR. legs, except anterior tibiae, entirely black.

♂. Anterior margin of clypeus slightly produced medially; antennae shorter than in the ♀ and sub-clavate; clypeus entirely, scape beneath, tegulae, tubercles, apex of femora, the tibiae, except inner side of two anterior pair, and the tarsi, bright yellow. Length 4½-5 mm.

Agricultural College, Michigan (June and July). Collected by Mr. Gager C. Davis, to whom it is dedicated; Montana (Morrison). Coll. Amer. Entom. Society.

Niteliopsis plenoculoides. ♀.—Clypeus strongly carinated down the middle; front finely granulated, distinctly impressed down the middle, along the inner eye margins the front is finely punctured; eyes strongly converging to the top, the space between them at the vertex is about equal to one-half of the space at the clypeus; ocelli in a triangle, the lower one situated a little further away from the hind pair, than the latter are from each other; from each hind ocellus there extends down a short furrow, which reaches a little beyond the fore ocellus; antennae tolerably long, reaching to about the tegulae, the flagellum tapering on apical half; joints 2 and 3 of the flagellum longest, the first and fourth about equal; dorsulum with exceedingly close and fine punctures; metathorax above and on the sides finely granulated, with indistinct striations when viewed in certain positions; at the extreme base of upper surface there is a transverse series of small fovea and down the middle there is an im-

pressed line (this is not distinct in one specimen), the posterior face transversely rugose; tibiae and tarsi, with exception of the calcaria unarmed; tarsal claws rather short, stout and not toothed; abdomen elongate-ovate, the first three dorsal segments when viewed from the side are seen to be contracted basally and apically; last dorsal segment without a pygidium; three submarginal cells, the second petiolated, receiving both recurrent nervures; black; two transverse spots on the collar above, posterior half of tubercles, a spot near the middle of hind tibiae and the tibial spurs, whitish; apex of mandibles, tegulae and tarsi, testaceous; wings subhyaline; nervures black; face and clypeus, sides of thorax and abdomen, more or less, with silvery pile. Length, 6 mm.

New York; Colorado. In general appearance this species resembles *Plenoculus davisii* but the abdomen is differently shaped, the antennae are longer, the legs without spines, the second submarginal cell receiving both recurrent nervures and the last dorsal segment lacks a pygidial area. It seems to me that Kohl has erred in uniting *Niteliopsis* Saund., with *Solierella* Spin.* A comparison of the figures of these genera,† is, I think, evidence enough that they are not the same; while the species herein described agrees with the description and tolerably well with figure of *Niteliopsis* it does not agree with Kohl's description, nor Spinola's figure of *Solierella*. As nothing definite can be ascertained to show whether these genera are synonymous or not without an examination of Saunders's type, it seems best for the present to consider them distinct. But one other species of *Niteliopsis* is known and is from the Ionian Islands. The single species of *Solierella* inhabits Chili.

* Verh. zool.-bot. gesellsch. Wien. xxxiv, p. 207, 1884.

† *Solierella* Spin. Gay's Hist. Chile. Zool. tab. ii, figs. 5 a, b, c, *Niteliopsis* Saund. Trans. ent. soc. Lond., 1873, p. 410.

Cerceris austrina. ♀.—Clypeus subconvex, not produced, its fore margins rounded or subtruncate, strongly punctured, its lateral lobes small and indistinct; front, vertex and cheeks with coarse punctures, those on the cheeks strongest; inner eye-margins slightly converging towards the clypeus; ocelli placed in a low triangle; antennae tolerably long, thickened but little to the apex, first joint of the flagellum about one-quarter longer than the second, joints 2-4 about equal in length; thorax very coarsely punctured, the punctures on the mesopleurae irregular; sides of prothorax somewhat excavated or depressed; mesopleurae armed with two strong teeth beneath; enclosure on metanotum triangular, parted by a strong furrow which runs the entire length of the metathorax, and with a number of both oblique and transverse ridges; tibiae and tarsi strongly spinose, the hind tibiae very distinctly serrated on outer edge; the spines on fore tarsi forming the comb rather short and widely separated; dorsally the abdomen is less strongly punctured than the thorax, segments 1-5 reflexed at apex; ventrally the base and apex of segments 2-5 are impunctate; pygidial area almost exactly ovate, having the appearance of being scaly; black; clypeus, sides of face, scape beneath, basal half of mandibles, four anterior tibiae and tarsi in part a transverse mark on pronotum, separated in the middle, and scutellum yellow; greater part of antennae, pronotum, tegulae, legs, postscutellum, first abdominal segment above, second and third segments, except basal portions, rufous, apical portion

of second dorsal segment, yellow; face and clypeus clothed with pale silvery pubescence; head, thorax, and abdomen ventrally, with pale fuscous hair; wings fuscous, nervures testaceous. Length 11½ mm.

♂.—Middle lobe of clypeus somewhat pyriform, its anterior margin seemingly tridentate, in consequence of its middle portion being angularly produced; head coarsely punctured, the punctures on front, vertex and cheeks deepest; antennae longer than in the ♀, second joint of flagellum a little longer than either the third or fourth; mesopleurae not dentate; wings subfuscous darker towards apex; pygidial area coarsely punctured; eighth ventral plate bifurcate; colored like the female, except that the face and clypeus is entirely yellow, and dorsal abdominal segments 2-5 have generally a narrow, yellow fascia at apex, the first and second segments are both above and beneath generally rufous; in some specimens the second segment has no trace of rufous, while in others the first three segments are more or less marked with that color, apical half of antennae black. Length 10-12 mm.

So. Florida (Chas. Robertson). 1 ♀ and 15 ♂ specimens. Allied to *verticalis* Smith, but differs in the less coarse sculpture, the roughly and many ridged enclosure on metanotum (in *verticalis* it is smooth) and the somewhat stouter antennae. It resembles *verticalis* very much, but the want of the rufous color on vertex and metathorax will generally distinguish it. It is larger than *rufopicta* more coarsely sculptured and the flagellum is not so much thickened on apical portion.

A CORRECTION.—In *Psyche* 1893 (v. 6, p. 379) I described larvae received from Mr. J. B. Lambert as *Arctia blakei* Grote. Since then Mr. Lambert has sent a second specimen, like the one from which the eggs were obtained except that the veins of fore wings are narrowly lined with flesh color. This leads me to believe that the larvae described were really those of *A. ornata* Pack. and the varietal name proposed by me will not stand.

The synonymy will be:—

EYPREPIA (CALLARCTIA) ORNATA Pack.

simplicior Butl.

perpicta Dyar.

var. ACHAIA G. & R.

edwardsii Stretch.

var. COMPLICATA Walk.

dahurica Grote.

ochracea Stretch.

barda Hy. Edw.

Harrison G. Dyar.

BIBLIOGRAPHICAL NOTES.—IV.

BY SAMUEL HENSHAW.

MINOR ENTOMOLOGICAL PUBLICATIONS.—GARDEN AND FOREST, Vol. I (1888), contains the following notes and articles :—

- Packard, A. S. Arsenical poison in the orchard. p. 9.
 Packard, A. S. The red mite [*Tetranychus telarius*] on verbenas. p. 20, fig.
 Editorial. [Futility of plugging trees with nostrums.] p. 51.
 Packard, A. S. Certain cone-eating insects [*Pinipestis veniculella*, *Dryocoetes affaber*.] p. 100-101, f. 18-21.
 Osborn, Herbert. The banded hickory borer. [*Chion cinctus*.] p. 148-149, f. 26-28.
 Anon. Arsenical poisons on elm trees. p. 151.
 Farlow, W. G. Fungus diseases of insects. [Review of Thaxter's Entomophthoraceae.] p. 159.
 Packard, A. S. The work of a timber beetle. [*Monohammus confusor*.] p. 172.
 Anon. Cut-worms. [Agrotidae.] p. 177.
 Pearson, A. W. Vineyard notes from southern New Jersey. [Ravages and means against *Macrodactylus subspinosus*.] p. 256-257.
 Weed, C. M. Whitewash for rose beetles. [*Macrodactylus subspinosus*.] p. 307.
 Anon. [*Triphleps insidiosus* injuring chrysanthemums.] p. 312.
 Editorial. [Ravages of *Orgyia leucostigma*.] p. 314.
 Anon. Packard's Entomology for beginners. [Review.] p. 407-408.
 M., E. and Editor. Destruction of ants. p. 442-443.
 Jack, J. G. The red mite [*Tetranychus telarius*] on trees. p. 459-460.
 Vol. II (1889) contains the following :—
 Divers, W. H. How we rid our vines of the mealy bug. [*Pulvinaria innumeralis*.] p. 222.

- Packard, A. S. Boring beetles [*Teretrius americanus*] in the ash finish of a chapel. p. 254-255, f. 108.
 Smith, J. B. The imported elm leaf beetle, *Galeruca xanthomelaena* Schr. p. 292.
 Smith, J. B. Cut-worms. [Agrotidae.] p. 328.
 Smith, J. B. The white pine weevil. *Pissodes strobi* Peck. p. 378, fig.
 Hoskins, T. H. Insects and manure. p. 392-393.
 Jack, J. G. The asparagus beetle. [*Crioceris asparagi*.] p. 399-400.
 K., W. and Editor. The asparagus beetle. [*Crioceris asparagi*.] p. 430.
 Smith, J. B. The periodical Cicada. [*Tibicen septendecim*.] p. 436.
 Taplin, W. H. Roses and the larvae of the June-bug. [*Lachnosterna* sp.] p. 453.
 Jack, J. G. A new enemy [*Gossyparia ulmi*] of the elm. p. 461, f. 129.
 Hoskins, T. H. and Editor. Notes from a northern garden. [Ravages of Thripidae, *Trypeta pomonella*.] p. 476-477.
 Jack, J. G. A destructive cornel sawfly. *Harpiphorus varians* Norton. p. 520-521, f. 138.
 Williams, E. *Trypeta pomonella* in New Jersey. p. 527.
 Quis. *Ocneria dispar*. p. 562.
 Jack, J. G. A tulip tree leaf destroyer. *Cecidomyia liriodendri*. p. 604-605, f. 152.
 Anon. [Wheat sawfly, *Cephus pygmaeus*.] p. 612.

MISCELLANEOUS NOTES.—Dr. Carl Berg has left Montivideo and returned to Buenos Aires, where he has been given the directorship of the National museum in the place of the late Dr. Burmeister.

Mr. W. L. Distant has again left England for South Africa where his address will be at Pretoria, Transvaal.

The plates in the present number of Psyche illustrate Dr. Holland's article on West African moths and will be explained at the conclusion of his paper in the next number.

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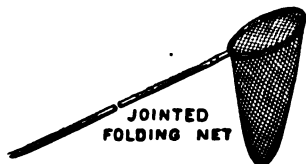
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PSYCHE.

THE PRIMITIVE NUMBER OF MALPIGHIAN VESSELS IN INSECTS.—VII.

BY WILLIAM MORTON WHEELER, PH.D., CHICAGO, ILL.

With these conclusions the object of the present paper is attained. As stated in the beginning, the homologies of the Malpighian vessels with other insect or vermian organs are most obscure, and if I venture to add some remarks of a critical nature, it is in the belief that a discussion of the difficulties attending the establishment of such homologies is not without a certain, albeit negative value.

It is an interesting fact, which has impressed several observers, that the fore-gut, and more especially the hind-gut in many insects, have a very regular hexagonal outline. This is most readily seen in the more primitive orders, like the Orthoptera, where it extends even to the mid-gut which is of entodermal origin. Minot* was struck with this peculiarity while studying *Melanoplus*. "I cannot but think," he concludes, "that it (the curious repetition of the number six) will be ultimately found to have some hitherto unsuspected meaning. There are six rows of teeth in the pro-ventriculus, six diverticula arising from the stomach, and twelve longitudinal

folds in each diverticulum. There are twelve (twice six) gastroileal folds, arranged in twos, each pair appearing as the double anterior termination of the six ileal folds, which, changing their character, extend backwards through the colon; finally in the rectum there are six rectal glands."

The hexagonal symmetry of the hind-gut makes its appearance during embryonic life, as I have observed in members of the orders Orthoptera, Coleoptera and Lepidoptera. The Malpighian vessels arise at the 6 angles, or horns of the proctodaeal wall. There is evidently, therefore, some correlation between the 6 vessels and the hexagonal outline of the hind-gut.

Miall and Denny* were, I believe, the first to offer an explanation for the hexagonal structure of the rectum. They are of the opinion that "the tendency to produce a 6-banded stomodaeum and proctodaeum may possibly be related to the 6 theoretical elements (two tergal, two pleural, two sternal) traceable in the Arthropod exo-skeleton, of which the stomodaeum and proctodaeum are reflected folds."

* Histology of the locust (*Caloptenus*) and the cricket (*Anabrus*). Second rep. U. S. ent. comm. 1878-79 relating to the Rocky Mt. locust. 1880. pp. 220-221.

* I. c. p. 126.

Mingazzini * too in his study of the alimentary canal of the phytophagous *Lamellicornia* concludes that the hexagonal structure of the rectum is "di grande importanza filogenetico, perchè si riscontra in quasi tutti gli ordini d'insetti finora studiati." Mingazzini adds as further evidence to Miall and Denny's suggestion that the proctodaeum presents 6 bands of longitudinal muscles corresponding to the 6 longitudinal muscles of a segment.

Miall and Denny's hypothesis is certainly ingenious, but I fear that it is untenable. To be admissible it would require that each of the 6 sides of the hind-gut should be parallel to one of the 6 exoskeletal elements of the segment (Fig. 1). The median dorsoventral

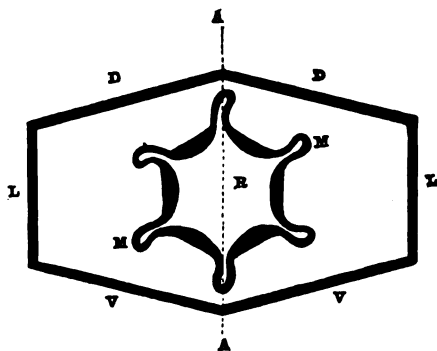


FIG. 1.

plane, represented by the line A A, should cut the prismatic hind-gut into two symmetrical halves, either of which

would contain three entire planes. But in reality this is not the case, as sections through the embryo show (Fig. 2); there being in the proctodaeum one dorsal, one ventral, and on either side two pleural planes. The median dorsoventral plane A A cuts the proctodaeum into two symmetrical halves,

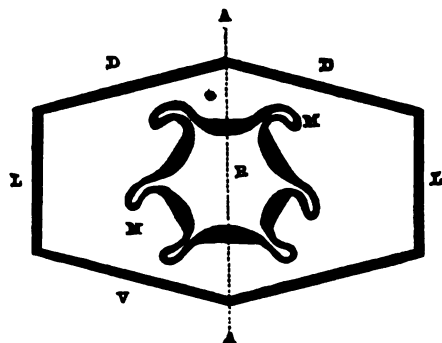


FIG. 2.

either of which consists of two entire and two half sides. It is therefore necessary to suppose either that the rectum has undergone a rotation of 30° on its median longitudinal axis—and this would produce a torsion of which there is not the slightest evidence in the embryo or adult—or that a single side of the proctodaeum does not correspond to a segmental element and this is, of course, equivalent to abandoning the hypothesis altogether.*

* Ricerche sul canale digerente delle larve dei lamellicorni fitofagi. Mitth. zool. stat. Neapel. bd. ix heft i, 1889, p. 95 at seq.

* Miall and Denny's remarks are hardly explicit enough. I have interpreted their hypothesis as referring to the sides and not to the angles of the hind-gut. On the supposition that each corner, or horn with the adjacent half sides is regarded as equivalent to an exoskeletal element, no very serious objection can be raised to the view.

The actual position of the proctodaeum in the body of the insect leaves no doubt that the Malpighian vessels are paired structures; there being a dorsal, a pleural and a ventral pair. These may be readily resolved into an anterior, median and posterior pair, if we go back to the earliest stage in the formation of the hind-gut and its diverticula in such a form as *Doryphora*. At this time the future long axis of the proctodaeum lies at right angles to the long axis of the ventral plate, so that the vessels budding from its walls may be regarded as arising in three consecutive pairs.

If we go a step further and look for the meaning of the paired arrangement of the vessels we are at once confronted with difficulties. Two alternatives present themselves:

1. The number of vessels is simply correlated with the number of rectal folds, and the regular prismatic character of the rectum requires some other explanation than the presence of the vessels, since it recurs also in the fore-gut. According to this alternative the 6 Malpighian vessels belong to one segment, the eleventh abdominal, or telson, from which the proctodaeum arises.

2. Each pair of vessels represents a metameric unit. Hence three separate segments must have contributed to the formation of the proctodaeum. This alternative, if accepted, only leads to further difficulties, since the vessels must either be the serial homologues of paired ectodermal structures be-

longing to the more typical anterior abdominal segments or such structures no longer exist in the Insecta and must be sought for in the more ancestral Articulata (*Annelida* presumably). Insect structures which may be homodynamous with Malpighian vessels are:—

- a. The tracheae. These are known to arise as tubular invaginations of the integumental ectoderm pleural to the appendages, a pair to a segment. They occur only as far back as the eighth abdominal metamere. As the ninth, tenth and eleventh segments are ectracheate we might hope to fill this gap with the three pairs of Malpighian vessels, on the assumption that these diverticula had in some way come to arise from the proctodæal instead of the integumental ectoderm.

- b. The oenocyte-clusters. These, as I have shown in a former paper,* arise as paired ectodermal cell-masses just caudad to the tracheae. They, too, are wanting in the ninth to eleventh segments.

The Malpighian vessels resemble the tracheae in being tubular, the oenocytes in the glandular character and large size of the cells. The faint invagination, which still accompanies the formation of an oenocyte-cluster in embryonic *Orthoptera* and *Coleoptera*, may be the last trace of the lumen of a tube, the disintegrated walls of which are now represented by the oenocytes.

- c. The nephridia. I have pointed

* Concerning the "blood-tissue" of the Insecta. *Psyche*. Feb.-April, 1892.

out* that the sexual ducts arise in Xiphidium as hollow diverticula of the somites, like the nephridia and sexual ducts of *Peripatus*. It is, however, only the mesodermal portion of the nephridia which arises in this way; if what students of annelid development tell us prove to be correct, each nephridium must also have a small proximal piece derived from the ectoderm. The oenocyte cluster may be this piece disintegrated and changed in function. I deem it probable that the insect nephridium has passed through the following stages:

1. The nephropore (now represented by the oenocyte pit in the embryo) became occluded and then obliterated together with the lumen of the ectodermal portion of the nephridium.

2. With further degeneration the ectodermal and mesodermal anlagen of the nephridium failed to unite during ontogeny and persisted as separate structures.

3. These two anlagen took on new functions — the ectodermal or oenocyte portion acquiring some function perhaps analogous to that of the thymus in vertebrates; the mesodermal portion becoming converted partly into the corpora adiposa and in part into the sexual ducts.†

The Malpighian vessels, if at all comparable to nephridia, can represent only the ectodermal (oenocytic) ends. On the trisegmental hypothesis the vessels would be equivalent to three pairs of oenocyte-clusters, which had preserved their tubular character and excretory function. But the great difficulty lies in understanding the process whereby these three pairs of metameric and originally integumental structures could be carried into the anal invagination and appear ontogenetically as hollow buds at its inner end. On the other hand my hypothesis is beset with fewer difficulties, if we suppose that the three pairs of Malpighian vessels do not represent three metameres, but only a single one, for it is easy to understand how a single pair of oenocyte tubules could be carried in and subsequently, in the remote ancestors of existing insects, give rise to three pairs of vessels by a simple process of budding.

These considerations lead me to reject the trisegmental hypothesis and, while regarding 6 as the primitive number of Malpighian vessels in insects, to postulate only a single pair in more ancestral *Articulata*.

The University of Chicago.

Sept. 1892.

* A contribution to insect embryology. *Journ. of morph.* vol. viii, no. 1. 1893, p. 116 et seq.

† The fat-body retains to this day a nephric function inasmuch as it stores up urates often in considerable quantity. Kowalevsky (*Ein Beitrag zur Kenntnis der*

exkretionsorgane. *Biol. centralbl.* bd. ix, 1890, p. 42 et seq.) in a long series of experiments found that carmine, chloride of iron, and litmus were abstracted from the blood by the cells of the pericardial fat-body. In *Muscid* larvae the cells of the garland-shaped strand have a similar function.

(Continued from page 552.)

secondaries are fuscous, slightly darker at the anal angle. On the under side both wings are fuscous, the primaries clouded with darker fuscous on the costa near the base, and crossed by an incomplete transverse limbal line of pale fuscous. The secondaries are crossed by incomplete parallel median and limbal transverse bands of dark fuscous. Expanse, 38 mm.

MAGUZA, Walk.

My friend, Dr. Frederic Moore of London, has assured me that the following species is correctly referred to Walker's genus *Maguza*, which was erected for the reception of a South American species. A close microscopical study of its neururation shows great similarity to that of the preceding genus, *Dinotodonta*, the most marked difference being the fact that the lower branch of the inferior vein in the primaries does not diverge as in *Dinotodonta*, but coalesces after its origin with the main vein a short distance beyond the base. The form of the wings is also different, being relatively shorter and broader in the case of the primaries and without lobes on the inner margin, and in the secondaries having the costa evenly rounded or arched from the base to the apex, and the outer margin evenly rounded. The legs are also much shorter than in the preceding genus, and hairy. The neururation again suggests as in the case of the preceding genus a relationship to the *Notodonts* in that vein five in the primaries springs from the middle of the cell.

197. *M. Africana*, sp. nov. ♂. Palpi pale cinereous on the lower side; upper side of palpi, front, and collar dark brown; pategia dark brown, margined externally with paler brown. Upper side of thorax and abdomen fuliginous. Anal tuft pale ochraceous. Lower side of thorax, abdomen, and legs pale gray. The primaries on the upper side are light wood-brown with the outer third vandyke brown this outer area being

traversed by a pale cinereous line, and separated from the inner area by a narrow regularly curved pale ochraceous line defined inwardly and outwardly by very narrow darker lines. Just within this defining line a little below the costa is a patch of dark brown, within which is a minute whitish ocellus. There is a broad curved sub-basal band of vandyke brown crossing the lighter inner area besides a few spots and longitudinal streaks of slightly darker brown between this sub-basal band and the pale ochraceous line which defines the dark outer area inwardly and two black dots bear the costa just beyond the base. The secondaries are uniformly fuscous with the costal area testaceous, shining. On the under side both wings are pale fuscous, each crossed by a paler transverse limbal band defined inwardly and outwardly by parallel darker shades. The secondaries have an obscure discal dot. Expanse, 32 mm.



Maguza Africana, Holl. ♂ $\frac{1}{2}$.

MACROSENTA, gen. nov.

The neururation of the wings is almost identical with that of the preceding genus. The abdomen is, however, relatively much longer, and in fact projects for half of its entire length beyond the posterior margin of the secondaries. It is long, slender, and tapering, being provided with a slight bunch of hairs. The palpi are long, produced; the second joint viewed laterally is elliptical in outline; the third joint is elongated, conical, and bent outwardly from the axis of the body; the first and second joints are compressed. The antennae are filiform. The legs are relatively long and moderately

hairy; the second pair armed with a terminal spur, the third pair with two terminal spurs. As in the two preceding genera, the radial in the primaries springs from the middle of the cell. Type, *Macroseta longicauda*, Holland.



Macroseta longicauda, Holl. ♂.

198. *M. longicauda*, sp. nov. ♂. Palpi below whitish, laterally pale fawn. Front white; collar, patagia, and upper side of thorax fawn. Upper side of abdomen pale cinereous; lower side of abdomen and legs white. Primaries on the upper side with the costal area very pale fawn, with the lower two-thirds darker fawn. These two tracts are separated from each other by a dark subcostal ray, which runs from the base to the apex, curving upwardly to the apex, and is marked about its middle by a deep black longitudinal spot, swollen at its outer extremity. In addition the primaries are crossed by geminate sub-basal and submarginal parallel series of brownish dots. There is also a very faint sublimbal transverse band of gray, which runs parallel to the submarginal series of dark dots. The secondaries are uniformly fuscous on the upper side. On the under side both wings are pale whitish-gray, with the median area of the primaries slightly darker. Expanse, 33 mm.

MAMESTRA, Treitsch.

199. *M. (?) tarara*, sp. nov. ♂. Front, collar, and patagia pale golden-green. Upper side of thorax greenish. Upper side of abdomen pale olivaceous; under side of thorax, abdomen, and legs pale olivaceous. The primaries on the upper side are pale golden-

green; the fringes evenly checked with darker olivaceous. The wings are traversed by zigzag transverse basal, sub-basal, transverse limbal, and transverse submarginal lines of pale silvery-green. There is a subtriangular olive spot at the base near the inner margin. The area between the basal and sub-basal line is clouded with olivaceous in the middle. There is an olivaceous spot in the middle of the cell and another at the end, both surrounded by narrow pale silvery-green lines, and connected by a longitudinal olivaceous shade. The area between the sub-basal and sublimbal lines on the inner margin is clouded with dark olivaceous and the area between the limbal and submarginal lines about the middle of the wing is likewise clouded with the same color. The nervules near their marginal extremities are marked with dark olivaceous. The secondaries are shining whitish, with the nervules near the apex dark olivaceous. The fringes of the secondaries are checked with pale olivaceous. On the under side both wings are shining creamy-white.

♀. The female is much larger than the male. The secondaries are blackish with the fringes white checked with blackish. On the under side both primaries and secondaries are fuliginous. The fringes are pale olivaceous checkered with black. Both wings have an obscure discal dot and are crossed by obscure incomplete transverse limbal and transverse submarginal lines. Expanse, ♂, 28 mm; ♀, 40 mm.

I have a numerous series of this species *ex larva*. Mr. Druce, who has examined them, has referred them to the genus *Mamestra*, with which they apparently agree, but the dissimilarity in the color of the sexes is so unusual as to suggest at least something anomalous.

WESTERMANNIA, Hübner.

200 *W. anchorita*, sp. nov. ♂. Front, collar, upper side of thorax and abdomen pale fawn. The primaries are narrowly

marked on the inner margin and broadly marked on the outer margin with pale rufous. This marginal band is marked by an irregularly curved submarginal series of minute brown dots. On the costa just within the broad marginal rufous band is a triangular spot of pure white. The remainder of the wing is plumbeous with a dark circular spot at the base annulated with a narrow white line and shaded about the middle of the wing with a broad >-shaped band pointing outwardly, defined inwardly and outwardly by narrow silvery-white lines, having at its vertex and at the extremity of the lower limb near the inner margin dark circular spots margined with a narrow circular white line. The secondaries are pale whitish. Both wings on the under side are whitish with the middle area of the primaries clouded with gray. Expanse, 27 mm.

EXPLANATION OF PLATES.

The numbers which follow the names of species refer to the serial number in the text.

PLATE 10.

- Fig. 1. *Lomodonta erythrina*, sp. nov. (75)
 2. *Heteronygmia stigmatica*, sp. nov. (68)
 3. " *argiloides*, sp. nov. (71)
 4. " *clathrata*, sp. nov. (69)
 5. " *arctioides*, sp. nov. (72)
 6. " *basibrunnea*, sp. nov. (70)
 7. *Laelia hypoleucis*, sp. nov. (86)
 8. " *ocellata*, sp. nov. (90)
 9. *Aroa nigripicta*, sp. nov. (91)
 10. *Dasychira sublutescens*, sp. nov. (95)
 11. " *ruptilinea*, sp. nov. (96)
 12. " *congia*, Druce, ♂.
 13. *Aroa lata*, sp. nov. (92)
 14. *Heteronygmia hypoxantha*, sp. nov. (74)
 15. " *rhodapicata*, sp. nov. (73)
 16. *Artaxa nigra*, sp. nov. (76)
 17. *Laelia lignicolor*, sp. nov. (83)
 18. *Euproctis Reutlingerii*, sp. nov. (67)
 19. *Euproctidion Gabunica*, sp. nov. (66)

20. *Artaxa mesomelaena*, sp. nov. (77)
 21. " *parallela*, sp. nov. (82)
 22. " *discipuncta*, sp. nov. (83)
 23. " *palla*, sp. nov. (79)
 24. " *melaleuca*, sp. nov. (80)
 25. " *rotunda*, sp. nov. (84)
 26. " *apicipuncta*, sp. nov. (85)
 27. *Balacra rubricincta*, sp. nov. (35)
 28. " *glagoessa*, sp. nov. (34)
 29. " *damalis*, sp. nov. (36)
 30. *Casphalia nigerrima*, sp. nov. (38)
 31. *Anace monotica*, sp. nov. (27)
 32. " *parachoria*, sp. nov. (26)
 33. *Apisa cana*, sp. nov. (25)
 34. *Alpenus multiscripta*, sp. nov. (41)

PLATE 17.

- Fig. 1. *Ilema gonophora*, sp. nov. (115)
 2. " *albibasalis*, sp. nov. ♀. (116)
 3. " *miserata*, sp. nov. (119)
 4. " *circumdata*, sp. nov. (120)
 5. " *albicostata*, sp. nov. (122)
 6. " *flava*, sp. nov. (124)
 7. " *albospargata*, sp. nov. (117)
 8. " *apicata*, sp. nov. (118)
 9. " *diluta*, sp. nov. (123)
 10. " *brunneicosta*, sp. nov. (121)
 11. " *pallida*, sp. nov. (125)
 12. *Ilema fusca*, sp. nov. (126)
 13. *Argila affinis*, sp. nov. (132)
 14. *Nioda nigristriata*, sp. nov. (130)
 15. *Argila basalis*, Wlk., ♀, (133)
 16. *Nioda agrotoides*, sp. nov. (129)
 17. " *erubescens*, sp. nov. (131)
 18. *Somera chloauchena*, sp. nov. (136)
 19. " *chloana*, sp. nov. (141)
 20. " *desmotis*, sp. nov. (137)
 21. " *chloromorpha*, sp. nov. (138)
 22. " *chloëropis*, sp. nov. (146)
 23. *Desmeocraera hinnula*, sp. nov. (186)
 24. *Somera bitioides*, sp. nov. (139)
 25. *Olene costiplaga*, sp. nov. (127)
 26. " *hyloica*, sp. nov. (128)
 27. *Notohyba viridis*, sp. nov. (105)
 28. " *striata*, sp. nov. (101)
 29. *Somera infima*, ♂, sp. nov. (142)

30. *Somera infima*, ♀.
31. " *falsa*, sp. nov. (144)
32. *Turnaca grisea*, sp. nov. (150)
33. *Scrancia modesta*, sp. nov. (187)

PLATE 18.

- Fig. 1. *Dasychira apateloides*, sp. nov. (98)
2. " *nubifera*,* sp. nov.
 3. *Notohyba nubifuga*, sp. nov. (99)
 4. " *delicata*, sp. nov. (100)
 5. *Oecura ocellifera*, sp. nov. (107)
 6. *Notohyba proletaria*, sp. nov. (103)
 7. *Thamnocera albilinea*, sp. nov. (109)
 8. *Hypotrabala castanea*, sp. nov. (158)
 9. *Metanastria porphyria*, sp. nov. (159)
 10. *Philotherma† spargata*, sp. nov. (160)
 11. *Stibolepis subiridescens*, sp. nov. (156)
 12. *Lebedodes cossula*, sp. nov. (183)
 13. *Dasychira? variegata*,‡ sp. nov., ♀.
 14. *Dasychira albosignata*, sp. nov. (97)
 15. *Oecura crucifera*, sp. nov. (106)
 16. *Cyrtogone lichenodes*, sp. nov. (182)
 17. *Estigena Africana*, sp. nov. (157)
 18. *Orgyopsis tenuis* sp. nov. (135)

* *Dasychira nubifera* sp. nov. ♀. In its markings recalling *Ercheia subsignata*, Walker, a noctuid. The body is pale brown, darker on the thorax. The primaries are pale wood-brown, with a darker shade running from the costa at the base diagonally to the middle of the inner margin, then sweeping upwardly in an irregular curve to the costa, which it reaches before the apex, the outer margin being broadly much paler than the rest of the wing. There are transverse basal, median, and limbal dark lines, and an irregular ocelliform spot at the end of the cell. The secondaries are pale cinereous. On the under side, both wings are ashen and both have a conspicuous discal spot and some incomplete lines beyond it near the costa. Expanse, 47 mm.

† *Philotherma*, Moeschler, Abhandl. Senck. nat. ges., bd. xv, p. 80.

19. *Terphothrix lanaria*, sp. nov. (134)
20. *Aroa omi-sa*, sp. nov. (185)

PLATE 20.

- Fig. 1. *Panglima gloriosa*, Butl. ♀.
2. *Jana marmorata*, sp. nov. ♂. (165)
 4. *Gastroplakaeis Greyi*, ♀. (171)
 5. " *Greyi*, ♂.
 6. " ? *forficulatus*, Moeschl. ♀ (170)
 7. *Jana nobilis*, sp. nov. (164)

PLATE 21.

- Fig. 1. *Methorasa cornu-copiae*, sp. nov. (2)*
2. " *complicata*, sp. nov. (1)*
 3. *Westermannia anchorita*, sp. nov. (200)
 4. *Plusia siculifera*, sp. nov. (5)*
 5. *Plusiotricha livida*, sp. nov. (9)*
 6. *Plusia Mapongua*, sp. nov. (4)*
 7. *Methorasa eximia*, sp. nov. (3)*
 8. *Gigantoceras geometroptera*, sp. n. (192)
 9. " *solstitialis*, sp. nov. (191)
 10. *Plusia Ogovana*, sp. nov. (6)*
 11. *Metaleptina nigribasis*, sp. nov. (193)
 12. " *albibasis*, sp. nov. (194)
 13. " *obliterata*, sp. nov. (195)

‡ *Dasychira (?) variegata*, sp. nov. ♂. Collar dark brown; upper side of thorax gray; abdomen fulvous with dorsal and lateral rows of black spots. The primaries are creamy marked with brown spots and lines. Of these the most conspicuous are a basal spot, a broad sub-basal brown band margined on both sides with paler, a large ovoid spot at the end of the cell, a triangular subapical spot of brown on the costa, a smaller brown spot near the outer angle, and a series of marginal lunulate markings. The secondaries are white narrowly margined with pale brown. The marginal series of lunulate markings is continued from the primaries, and there is a subtriangular brown spot at the anal angle. On the under side both wings are paler and the markings are more obscure.

♀. The female is like the male, but the spots are broader and more diffuse. Expanse ♂, 40 to 50 mm.; ♀, 55 mm.

*The numbers under Plate 21 marked with an asterisk are the numbers given to a new series of descriptions to appear in the next volume beginning with the January issue of *Psyche*.

THE DOLICHOPODID GENUS LIANCALUS LOEW.

BY J. M. ALDRICH, MOSCOW, IDAHO.

The genus *Liancalus* contained only one known North American species at the time of the publication of Loew's monograph in 1864; subsequently Osten Sacken in his *Western Diptera* described another. The present paper describes two more. I have not seen either of the earlier species, but it happens that one of the following is a near relative of Loew's, the other of Osten Sacken's, species.

Mik has separated a part of the European members of the genus to form the genus *Alloeoneurus*. None of the known American species are included in this new group.

The females of the following species have few if any available separative characters, except the yellow knees in *genualis*.

Table of species.

- | | |
|---|-----------------------------|
| 1. First joint of fore tarsi of male shortened. | 2. |
| Second joint of fore tarsi of male shortened. | 3. |
| 2. Last three joints of male fore tarsi of nearly equal length. | <i>similis</i> , n. sp. |
| Third joint as long as fourth and fifth together. | <i>querulus</i> , O. S. |
| 3. Knees yellow, | <i>genualis</i> , Loew. |
| Knees not yellow. | <i>hydrophilus</i> , n. sp. |

LIANCALUS HYDROPHILUS, n. sp.

♂. Front concave, green, somewhat overlaid with whitish dust, especially about the angles. Face rather wide, divided just below the middle by a transverse elevation, which

forms two slight arches toward the antennae. Above this elevation the face is concave, shining green; below it, flat and densely silvery-white pollinose. The flat palpi are silvery pollinose with a few black hairs. Antennae wholly black, short, the third joint with a blunt point. Cilia of the orbit black above, white below.

Thorax with a single median row of acrostichal bristles, smaller anteriorly; with two reddish-bronze longitudinal lines (enclosing a golden-green one), abbreviated behind; on each side of these median lines is an area of beautiful blue color; beyond this, near the border of the dorsum, another bronze line, wide, semi-interrupted at the suture, an attenuated portion reaching nearly to the scutellum. The latter with six bristles. Pleurae green, more or less overlaid with a white dust, the metallic color usually showing through but slightly. This covering of white dust extends over the dorsum, except upon the bronze portions. Cilia of tegulae, whitish; halteres yellow.

Abdomen elongated, cylindrical, club-shaped at the apex, from which two long filaments project forward below, each bearing two lateral rows of upward-curving, long whitish hairs; these filaments almost reach the hind coxae. Sides of abdomen with sparse and delicate pile, longer on the anterior segments, forming a distinct posterior fringe on the first segment. General color of abdomen bluish-green, with white dust, except as follows: first segment with narrow brown posterior border; second and third segments with a narrow brownish-black border in front and a wide one behind, somewhat coalescing dorsally in an indistinct line; distal half of the fourth segment and a rather wide dorsal stripe brownish-black; fifth seg-

ment and the clubbed genitalia mostly black. Hair of abdomen yellowish-white, except upon the dark parts, where it is more brownish.

Legs obscure metallic green, the tarsi black; fore coxae very long, cylindrical, with delicate white hairs and a subapical row of black bristles; second joint of fore tarsi one fourth as long as the third, wider than the others, on the under side with a pad of dense short hairs (tubercles?).

Wings hyaline, a trace of gray across the middle portion, third longitudinal vein curved back to meet the margin behind the apex; beyond this point the margin is a little excised, and close against it lies an almost semicircular, opaque spot, snow-white in certain lights; this spot is a little nearer the third than the fourth vein; it is enclosed on the proximal side by a distinct, narrow, curved brown spot, beginning behind in the corner of the second posterior cell and continuing around into the marginal, where it gradually fades away along the border of the wing. The fourth longitudinal vein curves strongly backward just before reaching the posterior crossvein, where it makes an angle; there is another backward curve just at the end, in the brown spot. That section of the fifth longitudinal vein lying beyond the crossvein is about one sixth the length of the crossvein and almost obsolete. The border of the wing is excised deeply behind the termination of the fourth vein, and immediately behind this is produced into a point, minutely blackened at its apex and bearing a pencil of fine black hairs resembling a small bristle. At the end of the fourth vein is another of these pencils, much larger, and the two are convergent, projecting outward and downward.

Length 8.5 to 9 mm.; of wing, 7.5 mm.

♀. Eyes more widely separated; upper half of the face metallic blue, covered with fine corrugations diverging downward; lower half green, more whitish dusted. Palpi large, longer than in the male, grayish-yellow dusted, with black hair. Abdomen of mod-

erate length, borders of the segments more shining green or bronze than black. No distinct spots on the wing, but a very faint cloud at the apex and the same median cloud as in the male. Margin of wing regular in outline; last section of fifth vein distinct, tarsi plain.

Length 7 mm.; of wing, 7 mm.

Black Hills, S. D.; elevation over 5000 feet. Numerous specimens of both sexes.

Closely related to *genualis* Loew, but readily separated by the yellow knees of the latter, and by the marked differences in the wings of the males.

I believe this is the largest species of the family Dolichopodidae so far known; certainly it is the largest North American species.

The habits of this species deserve notice. Schiner says the genus is found in the moist places about waterfalls. I found *hydrophilus* in two places near Custer, S. D., last August. Following up a little rill in a meadow east of town, its origin is found in a deep, round pool, thirty feet across, at the head of a small ravine. This pool is just at the foot of a ledge of rocks some fifteen feet high. From several seams in the rock there is a gentle flow of almost ice-cold water, which covers a considerable area of vertical rock in a thin sheet. Standing in this icy water were my flies! They would scarcely alight on the neighboring dry warm rock at all, but when disturbed merely moved to another part of the water. The second place was between Custer and Harvey Peak. Here a small stream flows through a narrow gap in a high palisade of rock. A dam twenty feet high in the gap creates a small artificial lake. Below the dam is an

area about thirty feet square that is shut in on three sides by masonry and solid rock, the open side being toward the north. In the coolest, darkest, dampest nook at the foot of the dam were a few more *hydrophilus*, not quite standing in the water, but on very moist rock.

Nearly half of my specimens have become greasy since capture,—a very rare trouble among the species of this family. It suggests a modification of their tissues from the normal type of the family to adapt them to the low temperature under which they exist.

LIANCALUS SIMILIS, n. sp.

♂. Differs from the foregoing as follows: thorax much duller in color; hypopygium destitute of filaments, with only minute

lamellae; fore metatarsus hardly one-fourth the length of the following joint, which is a little enlarged, with a slight fringe on the sides and a dense short brush below, the three following joints of equal length; wings on the apical two-fifths clouded with brown, the infuscated area rather indefinite in extent; margin of the wing not excised, third vein ending before the apex.

Length, 6.1 mm.; of wing, 7 mm.

♀. Differs from *hydrophilus* only in having the general color more pure green, without the extreme contrasts of blue and bronze; the wings of one specimen have more brown, which takes the form of three well defined spots, but this is evidently variable.

One male, two females, Washington (state), University of Kansas collection.

The principal differences between this species and *querulus* are in the structure of the male fore tarsi.

TWO NEW FORMS OF DIASPINAE.

BY T. D. A. COCKERELL, LAS CRUCES, N. MEX.

(1.) *Aspidiotus uvae*, Comstock var.
coloratus, n. v.

♀. Scale about $1\frac{1}{2}$ mm. wide, broad oval, flat, dull pale orange-brown, exuviae concolorous, thinly covered, first skin rather pale.

♀. Broad pyriform, pale orange. Three pairs of lobes visible in immature specimens, but the middle pair only prominent. In the adult only two pairs of lobes are present, and of these the second pair might almost be described as rudimentary. The middle lobes are close together but not touching, prominent, squared, notched on each side. The plates and incisions are practically as in *uvae*, so also are the anal and genital orifices—though the former in Comstock's figure

(Rep. U. S. Dept. Agr. for 1880) appears to be too small. The terminal segments are striate after the manner of *ostreaeformis*, etc., which I find is also the case with *uvae*. The grouped glands differ a little from *uvae*; as the median group, represented in *uvae* by two orifices, is wanting in *coloratus*; and the anterior and posterior lateral groups of *coloratus* run together, forming one long group of 11 to 15 orifices on each side—or may be separated by a short interval, in which case the cephalolateral group has about 8, and the caudolateral about 9 orifices.

Eggs bright lemon yellow.

♂ scale elongate oval, with the exuviae towards one end.

Hab. Las Cruces, New Mexico, 3,800 ft. alt., on *Chilopsis*; scales crowded on the

under side of the leaves, producing a pustular appearance on the upper side.

History. This scale was discovered by Hon. A. L. Christy in Las Cruces, and was examined by Prof. C. H. T. Townsend, who gave a short account of it as *Aspidiotus* n. sp.? in Bull. 7, N. Mex. Exper. Station (1892) p. 11. Prof. Townsend sent it to Prof. Comstock, who said it was unknown to him, and probably undescribed. On July 7, 1893, I found it in abundance close to the railway depot in Las Cruces, and after examining it, came to the conclusion that it was a new species. Although I had seen *A. uvae* in Jamaica, it did not occur to me that it could be that species, partly because Professor Comstock did not recognize it, and partly because the food-plant and habit were different. However, I sent some to Professor Riley, who remarked that the species came nearest to *A. uvae*; and that led me to compare it with specimens of *uvae* from Ithaca, N. Y., kindly sent by Mr. R. H. Pettit. The result is that I cannot by any means distinguish it as a species from *uvae*, and even as a variety it is not well marked, and would hardly be separated but for the difference of locality and food-plant.

So far as observed, it is confined to *Chilopsis*; and although grapes are extensively cultivated in and about Las Cruces, no case is known of its attacking the vines.

This adds another to the instances of Coccidae differing in habit though hardly or not at all in structure. They are what might be termed *physiological species*, in contradistinction to the ordinary or *anatomical* ones. They suggest the idea that organisms present differential characters of a class which we are hardly beginning to understand.

- (2.) *Mytilaspis albus*, Cockerell, var.
concolor, n. v.

♀ scale elongate, narrow-mytiliform, grayish-white. Exuviae pale straw color.

♀. Elongate pyriform, black or brown-

black (dark brown by transmitted light), 1½ mm. long. Skin conspicuously striate (*albus* also has the skin striate). Three pairs of lobes; median lobes large and prominent, rounded, notched without, rather widely apart; 2nd lobes bifid, low, the caudad portion largest; third lobes low, bifid, the two parts about equal. A pair of spine-like plates between the median lobes; and one such plate beyond 2nd and 3rd lobes respectively. A spine by the outer margin of each lobe. Margin beyond the third lobe coarsely crenate. Margin in region of 2nd and 3rd lobes shows three or four sacs, elongated with bulbous ends—no doubt glandular. The anal orifice is at a considerable distance from the caudal extremity. The ventral glands are not in well-defined groups, but scattered. On each side of the anal orifice, slightly cephalad of it, is a group of about 8 orifices, not very close to each other; and between this and the third lobe is another scattered rather elongate group of about 8; and a few other orifices are scattered here and there, some single, others in little groups of 3 or 4.

Egg. The eggs (in caustic soda) are peculiar for being of a dirty prussian-green color.

Larva. Elongate oval, eyes blue-black. Last joint of antenna with two moderately long hairs. Tarsal knobbed hairs long and slender, with small knobs. Caudal filaments ordinary, but some broken off.

♂ scale as usual in *Mytilaspis*.

Parasite. Many ♀ scales show holes where a parasite has escaped.

Hab. Las Cruces, New Mexico; in great numbers on a chenopodiaceous plant, on which are also found *Orthesia* n. sp., larvae of *Lycaena exilis*, and other interesting things. It mostly infests the stems, but the leaves show some scales, both on upper and under sides.

When I found this, I thought it must be a new species, and it was surprising to find

that it could not be separated from *M. albus* which I lately described from specimens on a malvaceous plant in Jamaica! There are differences, indeed, in the color of the exuviae and other small points, whereon a new variety is founded—but after comparing *concolor* with the types of *albus*, I can see nothing to separate them specifically.

Thus we have:—

(a.) *albus*. Jamaica, on a malvaceous plant, alt. 50 feet above the sea, climate very humid, tropical.

(b.) *albus* v. *concolor*. New Mexico, on a chenopodiaceous plant, alt. 3,800 ft., climate very dry, not tropical. (One can scarcely say *temperate*, the summer heat being greater than in Jamaica). Truly a singular distribution!

A NOTE ON THE LARVA OF DATANA FLORIDANA GRAEF.

BY HARRISON G. DYAR.

Having examined some specimens of the larva of *Datana floridana* in the collection of the Museum of Comparative Zoology at Cambridge, I am able to confirm the description by Mr. Koebele (Bull. Brooklyn ent. soc. iv, 21) and to add that the lateral lines are slightly broader than the intervening black spaces, or as broad; not confluent at the extremities. The large, normal hairs are white, and arise singly from minute tubercles; the fine, short (secondary) hairs are black, very

inconspicuous without a lens, and not differing from the corresponding structures in *D. major* and *D. palmii*. The species is closely allied to *D. palmii*, and may prove, on further investigation, to be not specifically distinct. The following table may replace the one given by me (Ent. amer. vi, 132). I include the names of the three species whose larvae are unknown, in the order in which they will probably be found to belong.

MATURE LARVAE (Stage V).

Secondary hairs much shorter than primary ones.

Hairs concolorous, pale.

Cervical shield black. *angusii*.

Cervical shield yellow.

Lateral lines separate at extremities. *ministra*.
[*californica*].

Lateral lines confluent at extremities. *drexellii*.

Hairs not concolorous.

Secondary hairs black; head red.

Lateral stripes broken into spots. *major*.

Lateral stripes continuous.

Stripes narrower than the subdorsal black space; head pale red. *palmii*.

Stripes broader than this space; head dark red. *floridana*.
[*modesta*].

Secondary hairs brown; head black or red. *perspicua*.
[*robusta*].

Secondary hairs nearly as long as primary, concolorous.

Cervical shield black. *integerrima*.

Cervical shield yellow. *contracta*.

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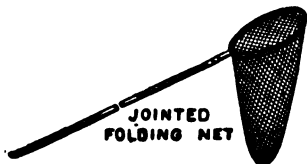
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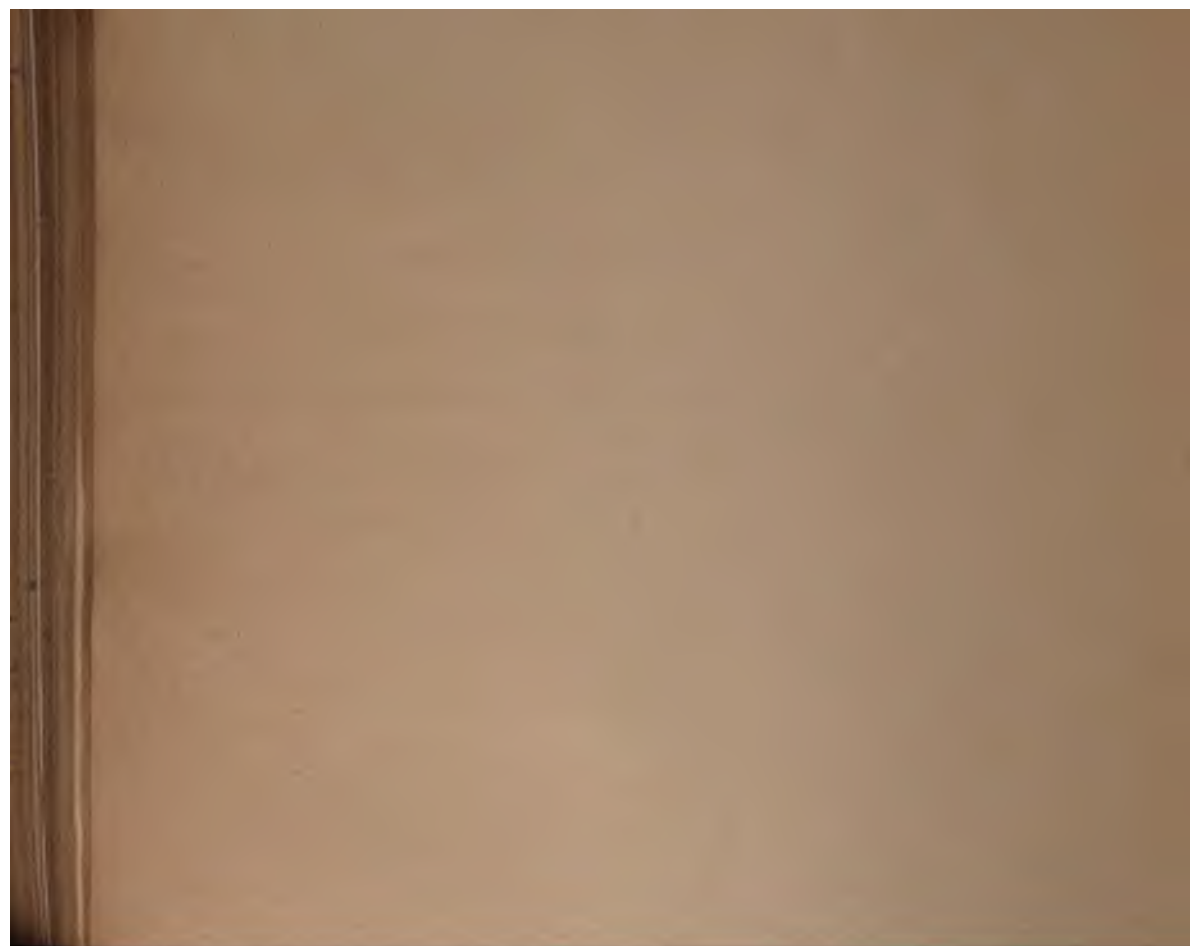
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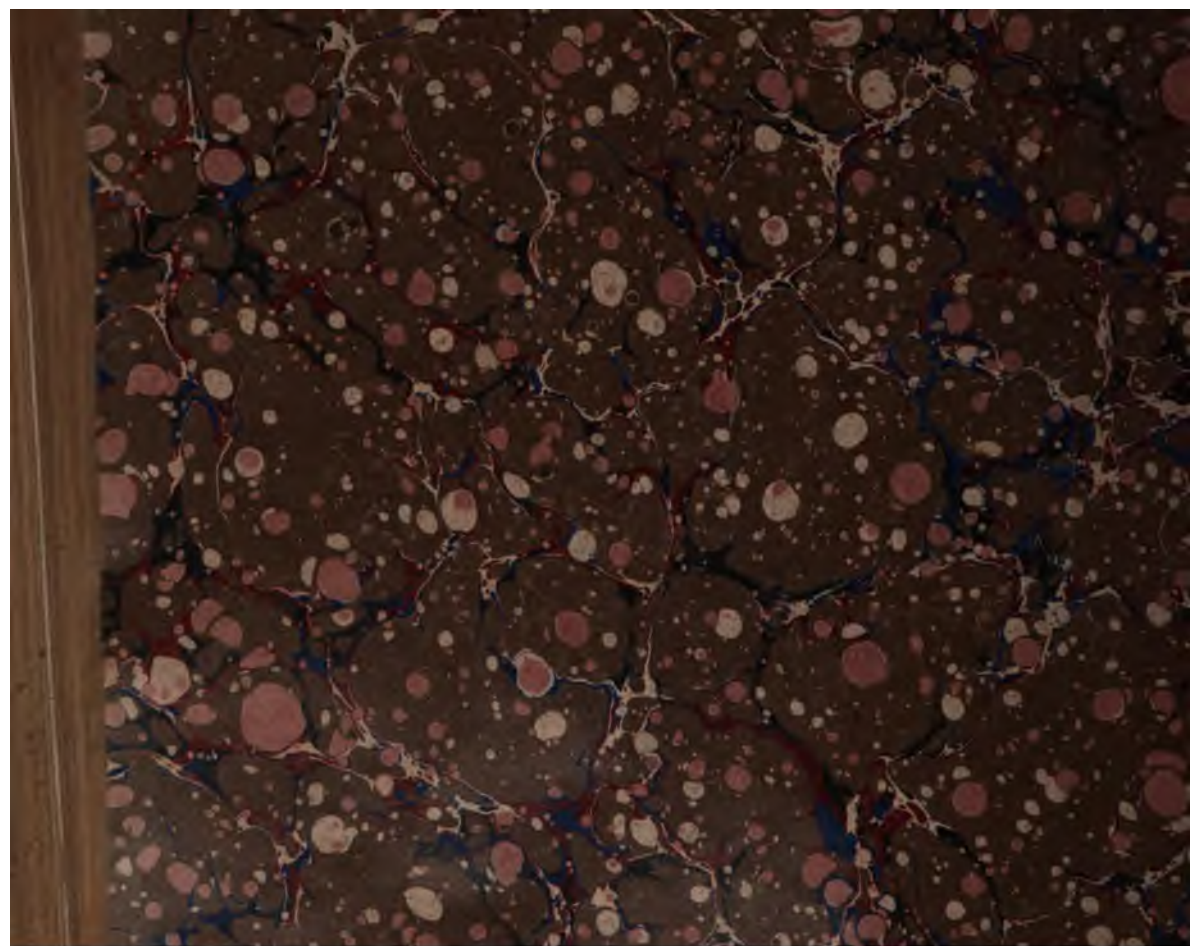
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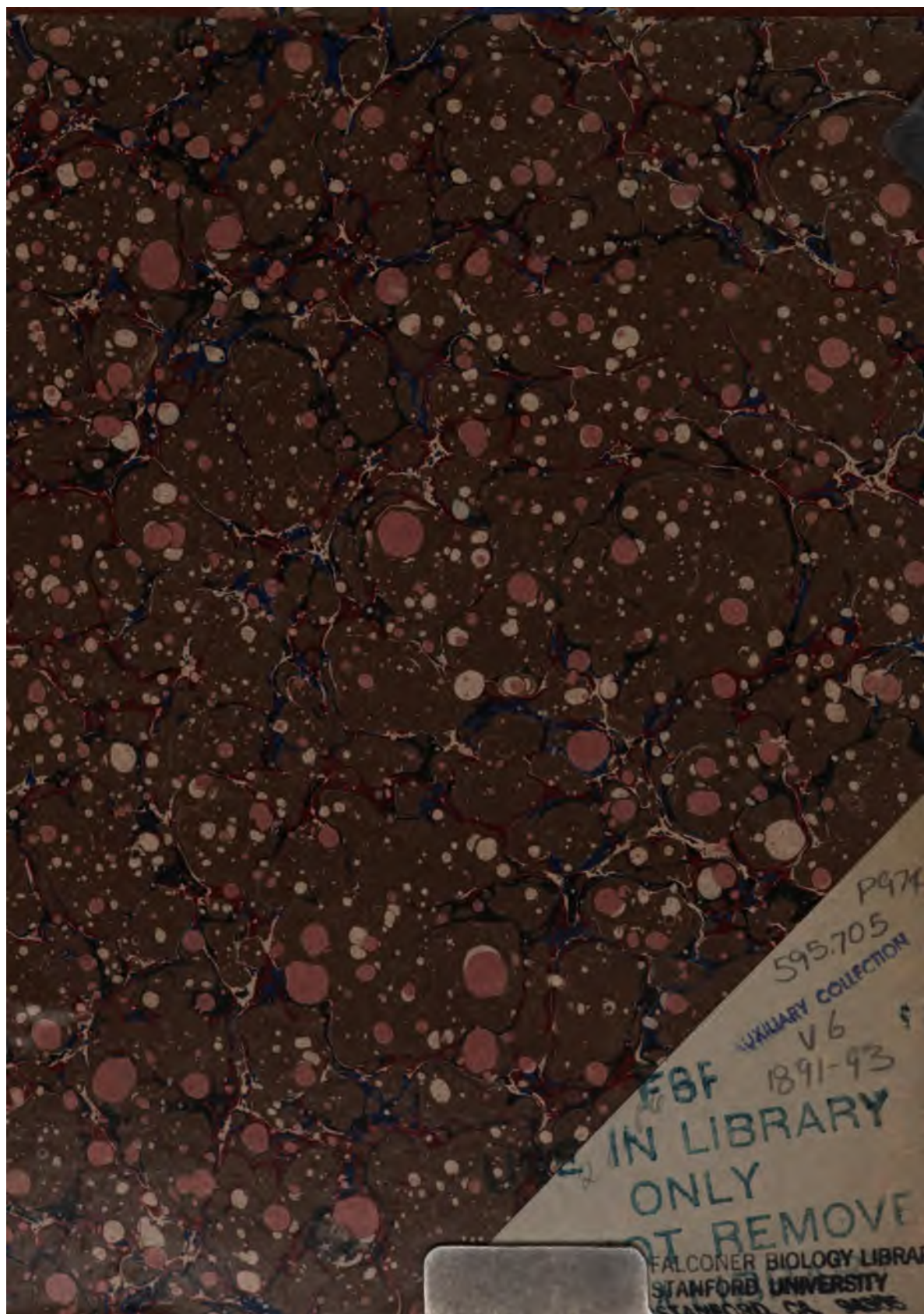
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